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[No. 7

	PAGE		PAGE
<i>University of Orissa</i>	315	<i>Ramanujan—His Life and Work.</i> M. R.	
<i>Silver Jubilee Convocation</i>	318	SIDDIQI	343
<i>Research Workers and the Patent System.</i>		<i>Metrology of Punch-marked Coins.</i> K. A. N.	345
BY DR. P. K. KAPRE	319	<i>An Aid to Study of Kant.</i> R. NAGA RAJA	
<i>On the Malabar Cyclone of May 1941.</i> BY		SARMA	346
C. RAMASWAMY	322	<i>Centenaries—</i>	
<i>Rai Bahadur Prof. K. C. Mehta, Sc.D.</i> ..	324	<i>Baskerville, Simon (1574-1641)</i> ..	347
<i>Letters to the Editor</i>	325	<i>Science Notes and News</i>	348
<i>Reviews</i>	336	<i>Academies and Societies</i>	352

UNIVERSITY FOR ORISSA

IN determining the type of university most suitable for Orissa, the University Committee appointed by the Congress Ministry in 1938 has reached the decision that a wholly centralised variety would not accord with the actual requirements of the Province, and would not be justified either by the distribution of the collegiate institutions in the State or by the stage of educational development now attained. Presumably after carefully investigating the wealth of experience accumulated in many places and in many directions, the Committee have favoured the establishment of an affiliating university at Cuttack, and it must be remembered that there is already a similar university functioning at Patna.

Since the older Universities of Calcutta, Madras and Bombay still retain the garb though not the clothes of a mere examining body, it may be reasonable to suppose that the judgment of the Orissa Committee is wise, especially in view of the circumstances prevailing in the Province. The jurisdiction over which the new university will exercise its control is fairly limited,—an advantage which will promote its efficiency. Further it may not be absolutely a correct policy to break with the past.

It is true that under the stimulus of the Universities Act of 1904 and under the influence of public opinion people have come to regard that a university should share in the actual work of teaching, instead of

remaining an impassive body controlling higher education through public examinations. Not until the impact of popular demand became irresistible, did the universities established in 1857 readjust their constitutional machinery. The various reports of University Commissions have emphasised and approved the popular feeling that the universities must be invested with the responsibility of co-ordinating their functions with the social, physical and intellectual needs of their students, and with the economic and industrial activities of the State. The recent university projects inaugurated in the last few years accentuate and reflect this higher conception of the functions of a university.

We have not the full report before us. It would be premature to discuss the merits of the Orissa Committee's recommendations from the meagre extracts that have been published. Judging by their look, the proposed university will acquire the structural and functional pattern enjoyed by Madras till 1908, without, however, its congestion and extensive academic jurisdiction. These features may at first sight seem uninviting, but there can be little doubt that the recommendations of the Committee might contemplate an ultimate design by which it will gradually be possessed of possibilities transcending the scope of the original intentions. Even among the teaching universities there is not uniformity of pattern, for there are those which are strictly unitary in type in which all teaching of a formal nature is conducted by the university organization, and there is the second variety which fulfils its functions through the constituent colleges associated with it. India is sufficiently diverse to provide ample room for

universities of all complexions, and her requirements can be met by the unitary universities as well as by the affiliating universities.

Among the various causes which have militated against the fruitful development of the unitary universities or against any other type in maintaining a high standard of moral and intellectual endeavour within their jurisdiction, or in acting as clearing houses of knowledge promoting the material prosperity of the country, the greatest are lack of endowments and adequate subvention on the one hand and superfluity of student population on the other. The boundary line separating the different categories of universities must be, after all, in the long run, a matter of constitutional expediency, and need not necessarily be the means of such profound significance as to alter the fate and fortune of a whole country. What India wants is a network of inspiring seminaries of knowledge, within whose halls there are men who are little universities in themselves, and whose creative genius will fertilise the minds of young men, who in their turn will blossom into dynamic intellectual apostles. Sir Venkataraman placed in Sahara, Bow Bazaar or in the Indian Institute of Science is a smiling university in himself. It is obvious that, since mankind has not yet invented a process of making bricks without straw, the Indian universities suffering from chronic financial anæmia cannot be accused of lagging behind their foreign congeners, which can very well stand a considerable amount of transfusion. Nevertheless it must be gratefully acknowledged that the Indian universities struggling under severe handicap have produced work which is at

once impressive and significant. Orissa need not be troubled over the type. If it has ample financial support and potential men such as Sir Venkataraman, Professor Saha, Dr. Ghosh, Professor Sahni, Professor Krishnan and Sir Radhakrishnan, the proposed affiliating university will achieve distinction.

Even more serious than financial inadequacy is the unmanageable size of student population,—a condition hostile to the successful evolution of a corporate intellectual communion in the universities, comparable to the best traditions of the older British universities. All attempts in the direction of imposing restraints on the free admission of students must be deprecated. The greatest reproach of our universities is that they act as a sort of one-way traffic system, leading the students ultimately into blind alleys, instead of being centres of divergent radiation, along which young men could march in a spirit of hope and courage to places where they might fulfil their destiny. All the existing universities have a handsome but unexpressive face; viewed from any standpoint, their duplication is indefensible. We could put the available resources to a better purpose and might even hope of attracting more funds, if we plan a brotherhood of regional universities, having affiliations to each other, intimately related to the larger human problems, specialising in some departments of knowledge with provision for schools of research, instead of ambitious crowded schemes leading to duplication and wasteful effort. There is rather a great need for realigning our universities not on a constitutional but a federal basis, each

constituent university having autonomous control, directing its specialised department or departments,—humanities; pure and applied branches of science; social, political and economic science; professional colleges; technology; administration; transport, communication, commerce and statistics; finance and related institutions. Besides securing relief from congestion, the federal scheme will provide sufficient room for students belonging to communities with different occupations, aptitudes and outlook, and the present tendency to regard the passage of all university students through the same curricula of studies, which has become a normal practice, should give place to diversified courses concentrated in different specialised centres. It is not equitable that young men should be denied all facilities for education of the university standard, merely because they have no aptitude for the cast iron uniformity of studies.

The reconstruction of our universities for direct use to the society is a duty as instant as that of improving natural knowledge for discovery. They are not to be regarded merely as a channel of escape to a world of discontented young men, and should not seek vindication on remote and abstract criteria. A university is at bottom a social function, with inescapable social responsibilities and obligations, and if our universities are to live as a vital force, they must ever keep human values and problems in the forefront, and they must justify their existence by their contributions to the enrichment of the spiritual and material wealth of the nation.

SILVER JUBILEE CONVOCATION

THE UNIVERSITY OF MYSORE has just celebrated its Silver Jubilee to denote the completion of its twenty-five years of proud and fruitful existence. The history of this young and vigorous University is a noble record of solid achievements in every field of endeavour for which it has made ample provision. The expectations which were formed by its founders have been generously fulfilled and the University holds promise of future developments which will create for it the highest cultural traditions and the power of leadership which we associate with the best colleges of foreign universities. A large and distinguished gathering of representatives of other universities attended the Celebration and felicitated the authorities. The history of the administration of the Mysore University during the last quarter of a century falls into four definite periods of development, each co-ordinated with the other on the basis of a continuous policy of organisation and progressive consolidation. The first Vice-Chancellor, Mr. H. V. Nanjundiah, has had to deal with the constitutional machinery and to bring it into working order, and on the completion of his labours, he was succeeded by Sir Brajendra Nath Seal. During his period of office the University was pulled inside out and reassembled by initiating a series of reforms in the structure and functions of the University. When Dr. E. P. Metcalfe assumed charge, his duties consisted in guiding the even tenor of the University activities resulting from the academic reforms instituted by the previous administration. We may call this the flowering period. Mr. N. S. Subba Rao, who is now controlling and directing the destiny of the University, has, while conserving his inheritance, given a new orientation to the purpose and interpretation of University life. This is the fruiting season, promising richer and perennial crops.

A Special Convocation was held, which was addressed by the Chancellor, His Highness Sri Jayachamaraja Wadiyar Bahadur, who is a distinguished alumnus of the University. The refreshing feature of this address is its freedom from platitudes which form the staple of public utterances. It breathes a new spirit in consonance with the rapid changes in the social and economic spheres of national and international life and gives a new message which trans-

cends local interests. "The Government look to the University not only to supply them with public servants, but to assist the State in its manufacturing concerns by co-operating in research and development work; and still more important, to play its part in the democratisation of knowledge and in closing the gap between the educated and the uneducated." In all these activities the University has shown a commendable zeal, and in the voluntary organization known as University Teachers' Association, it has found an able and willing ally in the dissemination of knowledge. This institution for which India furnishes no parallel, organizes lectures with demonstrations on scientific and humanistic subjects in the language of the country in all centres and study classes among illiterate people in the rural areas. In all these efforts, the students, who have also organized themselves into small groups, render invaluable help, and what is most praiseworthy is that women-teachers and women-students take a prominent part in educating adult women and young girls in the villages. These visits are not spasmodic, but form an integral part of a carefully planned literary campaign, so that lapses are not permitted to occur. Generally at all these lectures and class studies, the Vice-Chancellor is present whose patriotic zeal and inspiring guidance must afford a stimulus to the honorary workers on the one hand and fill the hearts of the simple country people with feelings of joy and gratitude on the other. In this as in other organizations like "University Settlement", "The Social Welfare Committee", "The Adult Literacy Association", "The Music Club", "The University Unions", Mysore University is almost the solitary instance in India, daring to take the university life to the doors of the people. A university that contents itself with producing a few brilliant stars in an otherwise dark firmament has few claims upon the people; it must vindicate its existence by the amount of service it renders to the country. If this is the criterion of judgment, then Mysore has a proud record. We have pleasure in associating ourselves with the rest of India in offering the University our felicitations and in expressing our hopes that the dark corners of human existence in the State will soon radiate "sweetness and light".

RESEARCH WORKERS AND THE PATENT SYSTEM*

I. SHOULD INVENTIONS BE PATENTED?

BY

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THE first question which arises before the mind of a person who has made an invention is whether it is desirable for him to protect it by means of a patent. Presuming that the inventor can take out a patent for his invention, this question can be considered either from the standpoint of an inventor who from purely altruistic motives wants to make his invention freely available to the public so that they may enjoy its full benefits, or from the point of view of an inventor who has the motive of enjoying as many of the benefits of his invention as possible. To decide whether it will be worth the inventor's while to take out a patent in order to achieve either of the two above-mentioned objects, a thorough estimate of the assets and liabilities which will accrue to the inventor by taking out a patent for his invention must be made.

Before trying to analyse what will be on the credit and the debit sides if a person takes out a patent, it will not be out of place here to refer to a few misconceptions about the patent system, which are prevalent in the minds of many people.

There is a class of people who seem to think that a patent is akin to a certificate of merit whereby the utility claimed for the inventions is endorsed by the Government. This is not so. By the grant of the Patent rights, the Patent Office does not in any way vouch for all that is expounded or claimed by the patentee.

Another misconception is, that by possessing a patent a person would be able to manufacture an article by a slight alteration of a manufactured article based on an existing patent, so that the new article produced embodies all the essential features of the old one in addition to slight variations in non-essential details. This also is not true, as a later patent can in no circumstances prejudice the rights of an earlier patentee.

Now, a patent is a privilege or a right conferred by the Government by which the patentee can enjoy the exclusive right of working the patented invention, or authorising others to do so, as long as the patent right is in force. This right, however, is conferred on him subject to the condition that he makes a complete disclosure of his invention so that after the termination of the patent, the public would be able to make a free use of his invention. Other conditions which are imposed on him are, that he would not exercise his patent injuriously to the public, or in restraint of trade, or for illegal or immoral purposes, and that he would continue to pay an annual fee to keep the patent in force for the period for which the patent has been granted.

Coming back now to the main question, let us examine how the object of the philanthropic inventor would be achieved with regard to his intention of making over his invention for the free use of the public as early as possible. Such a person has two alternatives before him. He can either protect his invention and then make over the rights of using it to any one free of charge, or else, he can just leave it open to anyone who cares to make use of it. Some people, however, feel that if a patent is taken out for an invention,—the benefits of the invention are only enjoyed by the patentee. These people, in thinking so, overlook a number of relevant factors which play an important rôle in ensuring the availability of a useful invention for the public use. These factors are considered below.

First, in order that the public may become aware of his invention, information about it should be accessible to the public at a place where they would normally look for it. The Patent Offices are universally regarded as the repositories of all the ideas and suggestions put forward from time to time by inventors about various industries; and therefore, the Patent Office records are the most natural sources where the public would look for new ideas to improve their industries. It follows therefore that an

* The views contained in this article reflect the views of the author only and do not represent those of the Government and should not be taken as committing the Government in any way.

inventor who does not patent his invention, does not make use of the Patent Office records and thus foregoes the facilities provided by the most important agency through which the publicity of his invention amongst those who are likely to be interested in it, can be ensured.

The second factor which is generally overlooked, is the full appreciation of the fact that considerable expense has to be incurred by the manufacturer to develop an invention to such a degree of perfection that when the public come to know of it they should like it; and in order that they may also adopt it for practical use, he should make the article available to the public at an attractive price by manufacturing it by mass production. This also will involve a considerable outlay of capital because numerous experiments will have to be made during the development of the invention into a finished article. In the ordinary course of events, there is very little likelihood of anybody coming forward to undertake the trouble or to risk his capital for these purposes, unless he can reasonably hope to recover all the initial expenses incurred and subsequently to enjoy a fair margin of profit as a return for the financial risk and trouble he has taken.

To drive this point further home, the examples of Herbert Spencer's¹ easy-chair and Laval's² cream separator are given here. Herbert Spencer once invented an excellent invalid chair and wanting to give it to the world without any recompense, did not patent it. The result was exactly contrary to what he aimed at. No manufacturer dared to undertake its manufacture. Each thought to himself that if he succeeded, competitors would spring up and rob him of most or all of his profits, while there was always present the risk that he might fail.

The case of Laval's cream separator is equally illustrative. Many years ago, Laval designed a hand-worked cream separator for use in the household. In the interest of the world—as he mistakenly thought then—he threw his design open to any one who desired to make use of it. But no one did so, and instead of a plentiful supply of the cream separators at low prices, none were manufactured because no one would obtain a monopoly for their manufacture.

The third consideration is that even if a person does not take out a patent, he cannot prevent others from patenting the same invention and thereby deprive the public and himself from enjoying the benefits of his invention.

Then there is another danger in not taking out a patent. All the inventions are not usually published in scientific journals and those which are published may not embody in the publications all the essential features of the invention. This leaves a loophole for the man who imitates the invention in all the essential details and in his patent application puts forward a claim or claims which have not been clearly implied in the publications of the original inventor. The result is, that the imitator can get away with some one else's invention, as under the circumstances, the real inventor may not be able to oppose the patent successfully on the grounds of any valid anticipation. In cases where the original inventor has not taken out a patent for his invention but some one else has, the inventor, even if he is in a position to prove ultimately that he had made the invention available to the public before his rival appeared on the scene, will have to undergo no end of trouble and expense to prove that he was a prior inventor, that he had given publicity to the invention, or that he had used the invention to such an extent as to bar the subsequent grant of a valid patent for it. Moreover, in such contested cases, the expenses incurred in proving the invalidity of such patents, run into thousands or tens of thousands of rupees. On the other hand, if the inventor adopts the ordinary expedient of taking out a patent for his invention as soon as it is made, then it would cost him almost nothing to establish either his priority of invention or the non-patentability of the invention by his rival. Therefore, in the interest of the public as well as in his own interest, it is advisable for an altruistic inventor to take out a patent for his invention before it is too late.

It is a fact that there is always an innate prejudice against new ideas and especially new ideas when they happen to be in the technical field. Even an invention possessing great merit and advantages cannot, therefore, earn a good name unless the manufacture of spurious and inferior goods is as far as possible eliminated. To do this effectively, it must be possible for the

¹ *Economics of Our Patent System*, by Vaughan, p. 30.

² *The Engineer*, 156, No. 4056, p. 335.

inventor to control the production of new articles in their early stages of manufacture, in a pure and standardised form. How this sort of control can be exercised by means of the Patent system is very well illustrated in the case of the manufacture of 'Insulin' which was patented as soon as it was invented. The inventors then issued licences only to competent and reliable manufacturers, and the result of this control was that 'insulin' was manufactured in the standardised form only, so that medical practitioners could appreciate its good properties and 'insulin' became known as a very reliable drug. It is a moot point, however, whether the good effects of 'insulin' would have been appreciated as promptly as they have been, if the control in its manufacture, which was exercised by the patentees before it gained in popularity, had not been so exercised.

The above analysis of the question therefore shows that even from the point of view of the altruistic inventor, his object would be better served by patenting his invention rather than throwing it open to the public without any protection.

Next the question of the Research Worker and the Patent System will be considered from the standpoint of the inventor who wants to enjoy for himself all the possible benefits likely to accrue from his inventions. There are two ways by which he can do so. One is by keeping his invention an absolute secret while exploiting it, and the other is by patenting it. For the latter, the inventor will have to disclose it fully and the monopoly rights will be in force for a limited period only.

Let us take first of all the case of the man who wants to rely on secrecy as the preferred form of ensuring personal profits. A large number of inventions by their very nature are inherently incapable of being protected by secrecy. In the case of machinery, for example, the moment it is put in the market, it is subjected to the minutest scrutiny by the public with the result that secrets cannot exist as regards machine construction. Even in the case of "process" inventions which theoretically can be kept secret, a person who relies on secrecy relies on a thoroughly undependable method, for secrets are notorious for their tendency to leak out. Whatever precautions an inventor may take to maintain the secrets of his invention, there comes a time, and invariably this happens too soon, when his secrets

leak out. An interesting case occurred a few years ago when an inventor found out at great expense the secret process of spraying glass with a certain chemical compound so that the sprayed glass presented a golden lustre. The inventor left nothing to chance in order that his secret may not leak out. When chemicals arrived in sealed carboys, he removed the labels on them and substituted instead new ones with wrong names, so as to hide the identity of the chemicals. He used to mix the spraying mixture in the sealed sprayers with his own hands. Thus whatever was physically possible to keep his secrets, he did. But when a rival firm came to know of the bangles with golden lustre, they sent a few of their very clever men in the guise of workmen to the factory to find out the secret process. These disguised men got employment in the factory, and during the spraying operation, they sprayed a little quantity of the chemical on their shirt sleeves. On going home, they got the sprayed chemical analysed and thus the secret was out. An idea of the extent to which the inventor suffered monetary loss can be gauged from the fact that before the secret leaked out, lustre bangles used to sell for Re. 1 a pair and after the leakage of the secret similar bangles were available for as little as an anna a pair! At this point the reader may say that as the bangles became cheaper it was all for the good of the people. It is pointed out therefore that this person had to spend thousands for securing this secret process from abroad and by failing to get a patent for his invention at the proper time he became a ruined man. One can only speculate how many other industries suffer the same fate when the inventors do not protect them by means of patents.

Let us now examine how an inventor who decides to take out a patent for his invention benefits himself under the Patent System. As already pointed out, a patent gives an inventor the right whereby he can enjoy the exclusive privilege of working his invention. Hence, with a patent for an invention in his possession, even the most impecunious inventor can approach a financier on terms of equality and arrive at a satisfactory financial agreement with him with regard to the exploitation of his invention. The prospect of a monopoly will also induce the financier to undertake the exploitation of the invention. Hence there is no danger

of any useful inventions going waste or of their being exploited by others without an adequate and equitable reward. This will facilitate the progress of negotiations between inventors and manufacturers for the purpose of commercially developing the inventions to their mutual benefit.

So far we have dealt with the subject of Patent System in relation to the research worker and have shown, that viewed at

from all points of view, the Patent System provides the best form of securing the objectives of an inventor irrespective of whether he is actuated by altruistic motives or by motives of self interest. This is of course subject to the provision that proper steps and precautions are taken to secure a valid patent. What these steps and precautions are will be discussed in subsequent parts of the article.

ON THE MALABAR CYCLONE OF MAY 1941

BY

C. RAMASWAMY

(Meteorological Office, Poona)

RARELY do the cyclonic storms coming direct from the sea strike the Malabar coast. Since 1845, there have been only three storms which have developed in the Arabian Sea and hit Malabar. A few others, however, after forming in the Bay of Bengal have moved westwards across Malabar into the Arabian Sea. The storms of the first type cause more destruction in the coastal districts than the others, as they come straight from the sea without losing any of their energy in crossing the Ghats. The cyclone which struck Malabar on the 26th May 1941, belonged to the first type. A brief history of its development and movement is given below:—

On the morning of the 22nd May, the upper winds over Minicoy were blowing at 25–35 m.p.h. from the westsouthwest up to 2.0 km. and Colombo reported rough seas and 6" of rain. These observations suggested that the southwest monsoon was advancing in the southeast Arabian Sea. The monsoon continued its progress during the course of the day and burst on the Malabar coast by the next morning; Trivandrum reported 10", Cochin 7" and Calicut 5" of rain on the morning of the 23rd. Pressure started falling along the Malabar coast from the 23rd, the fall being greatest near

Trivandrum on the 24th. On the morning of the 25th, an area of negative pressure departures appeared off the Malabar coast. The upper winds over Minicoy were blowing this morning from the west with gale force at least up to 1 km. while those over Mangalore, which on the previous day were blowing at 15–20 m.p.h. from the south or southwest, had strengthened to 20–30 m.p.h. and backed to south or southeast at all levels up to 4 km. These observations indicated that a depression had formed in the southeast Arabian Sea with centre near Amini Devi. By 17 hours of the 25th, the upper winds over Minicoy and Mangalore strengthened further and the seas along the Malabar coast became rough, pointing to an intensification of the depression into a cyclonic storm. Till 15 hours of the 26th, the cyclonic storm remained practically stationary with centre near Amini Devi. Then it began to move eastwards and was centred close to the coast south of Calicut at 22 hours I.S.T. It struck the coast about 30 miles to the south of Calicut (near Ponnani) just before midnight. Calicut recorded a pressure deficiency of about 0.27" when the cyclone crossed the coast. The barometric depth at the centre of the storm might have been about 0.50". After

entering land, the storm weakened rapidly and finally blew itself out in the Palghat gap by the next morning.

The weather charts showing the positions of the storm at 17 hours and 22 hours on the 26th are reproduced in Figs. 1 and 2.

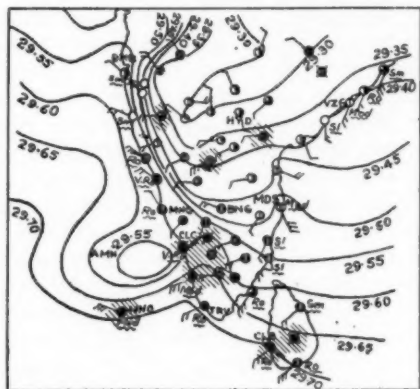


FIG. 1
26th May 1941 at 17 hrs. I.S.T.

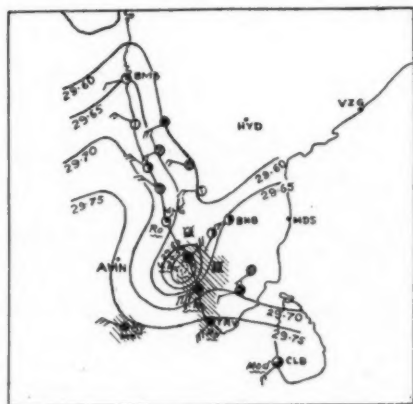


FIG. 2
26th May 1941 at 22 hrs. I.S.T.

Three feathers to the wind arrows mean a wind speed of 22-27 m.p.h., and four feathers 34-40 m.p.h. The hatched areas represent regions where rain was falling at the time of observation.

The following extracts from the Weather Diary of the Cochin Observatory which lay

in the monsoon sector of the cyclone will be of interest:—

"By 7-30 p.m. (26th) the wind began to increase in violence and was coming in great gusts from WNW (6 Beaufort scale) each gust increasing in force to a storm" "By 10 p.m. the wind had again shifted to WSW (30-40 m.p.h.) still increasing in violence"

"The storm continued to increase in violence after 00.00 hours." "The average speed of the wind from 00.00 hour to 12 hours when the storm was at its severest was 48 m.p.h. and the speed of the gust at their highest is estimated to be about 80 m.p.h."

The cyclone was responsible for widespread and locally heavy rain along and near the Malabar coast on the 26th and 27th. Some of the noteworthy falls were Quilon 5", Calicut and Ankamally (Perambavoor, Travancore) 6" each, Mannar (Travancore) 8" on the 26th and Vadakhancheri (Cochin) 10" on the 26th and another 12" on the 27th.

According to press reports, the cyclone caused terrible havoc along the Malabar coast, particularly in the district of Malabar. In addition to the loss of about one hundred lives, a large number of persons are reported to have been seriously injured. The damage to property was also large. In the coastal areas, thousands of houses and huts and a number of bridges and culverts collapsed and several villages were swept away. The Taluk of Ponnani in the Malabar District suffered most in this respect. The agriculturists are reported to have suffered heavy losses by the destruction of their gardens and growing crops. In a few places, landslides also occurred burying valuable arable lands.

The storm was of small extent. Even when it was only about 40 miles from Calicut the strongest surface winds along the coast blew at 30-40 m.p.h. in gusts. The area where the winds reached a speed of 40 m.p.h. and more was probably confined to a radius of about 40 miles.

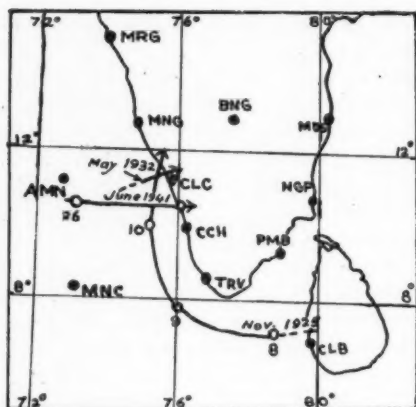


FIG. 3

Tracks of Malabar Storms.

In the absence of information about weather from ships, it is difficult to say when the storm developed the core of

hurricane winds around its centre. The microseisms recorded at the Bombay Observatory however seem to show that the storm became severe after it started moving towards the coast.

The tracks of the cyclones that have struck the Malabar coast since 1845 are shown in Fig. 3. It will be seen that the recent cyclone followed an easterly course before striking the coast. This was very unusual, as the storms which originate in the south-east Arabian Sea generally travel in a northerly direction. Indeed, there has been only one other instance of a storm taking an easterly course in the southeast Arabian Sea—that of May 1932, shown in Fig. 3. It is interesting to note that, even the recent cyclone, in the earlier stages, tended to move towards the north. But, in the end, it decided to move eastwards and release all its energy in Malabar; and it did—with what disaster!

RAI BAHADUR PROF. K. C. MEHTA, Sc.D.

WE have great pleasure in congratulating Professor K. C. Mehta, Rai Bahadur, M.Sc., Ph.D. (Cantab.), F.N.I., of Agra College, Agra, on the award of the Sc.D. Degree of the University of Cambridge. It is a rare distinction and is a just recognition of the valuable contributions made by the Professor to our knowledge of the wheat rust problem of India. Notwithstanding heavy duties at the College, he has been conducting, since the year 1923, research on the various aspects of an obscure problem of great national importance, at considerable personal ex-

pense in the earlier stages of this work. Since 1930, these investigations have been continued with adequate grants from the Imperial Council of Agricultural Research and with the help of temporary research staff. After a comprehensive study of the parasites concerned, Prof. Mehta has been able to suggest simple and inexpensive methods of control of rust epidemics on wheat and barley. Prof. Mehta presided over the Botany Section of the Indian Science Congress in 1929.

LETTERS TO THE EDITOR

	PAGE		PAGE
Polarisation of some Spectral Lines excited by Low Speed Electrons in a Discharge Tube containing Mercury or Mercury-Cadmium Amalgam as Anode. By B. N. GHOSH	325	Analysis of the Oil of <i>Ziphius cavirostris</i> (Goose-beaked Whale). By N. G. BAPTIST	331
An Improved Method for the Determination of "Prothrombin Time". By N. K. IYENGAR, K. B. SEHRA AND B. MUKERJI	326	A Long-glumed Mutation in Rice. By B. S. KADAM, M. V. GADKARI AND G. G. PATIL	331
The Inhibitory Effect of Excess of Calcium on Quick's Prothrombin Time. By D. V. S. REDDY AND C. VENKATARAMAIAH	328	The Structure of the Chromosome. By K. V. SRINATH	333
Air Temperatures given in Meteorological Reports Compared with those on the First Floor of a Building at Poona. By V. DORAISWAMY IYER	329	Note on the Origin of the Magnetite Deposits of Mayurbhanj State, Orissa. By S. C. CHATTERJEE	334
		A Margosa Tree without the Bitter Principle. By K. CHERIAN JACOB	335

POLARISATION OF SOME SPECTRAL LINES EXCITED BY LOW SPEED ELECTRONS IN A DISCHARGE TUBE CONTAINING MERCURY OR MERCURY-CADMIUM AMALGAM AS ANODE

It is well known that the yellow lines of mercury excited by slow electrons in a discharge tube show strong polarisation, with their electric vector in the direction of the electron beam. The author has studied the problem with special regard to their depolarisation, when mixed with cadmium atoms, and also when a weak transverse magnetic field is applied to the source. The electron beam produced by heating a Tungsten filament was shot vertically downwards on a surface of mercury or mercury-cadmium amalgam (2 per cent. Cd) used as anode. Light going out from one of the sides was allowed to fall on the upper half of the slit of a Hilger Constant Deviation Spectrometer, after it has passed through a Nicol, which could be rotated so as to transmit light with the electric vector either

vertical (let the intensity of this beam be I_1) or horizontal (intensity of this beam is I_2). For matching the intensity of the spectral lines the spectrum of a continuum as emitted by a Tungsten filament lamp was passed through the lower half of the slit of the spectrometer, the width of which could be varied by means of a calibrated screwhead. The whole arrangement thus acted as a polarisation spectrophotometer. By winding several turns of nichrome wire and passing current through it the tube could be maintained at a temperature of about 130°C . The heating current was cut off while taking observations so as to eliminate the effect of longitudinal magnetic field. The effect of the latter was however found to be very small and not more than 5 per cent. of the effect produced by a corresponding transverse magnetic field. The latter field was produced by placing near the tube a flat coil containing a large number of turns of wire through which varying currents could be passed. The voltage applied to the tube was 60 volts.

The results obtained are tabulated below:

			$\frac{I_1}{I_2}$ in Pure Hg tube					$\frac{I_1}{I_2}$ in the Amalgam tube			
H in Gauss	0	4	8	12	16	0	4	12	24
Hg	5791	..	9.0	8.0	7.0	5.8	3.4	2.5	2.1	1.9	1.6
	5770	..	9.0	8.4	7.4	6.1	4.0	3.0	2.7	2.4	2.0
	5461	..	5.2	4.6	4.4	3.9	3.5	2.0	1.8	1.6	1.4
Cd	6438	..						2.0	1.8	1.5	1.4
	5086	..						1.8	1.7	1.6	1.4
	4800	..						1.6	1.5	1.4	1.3

The above experiment thus brings out the following facts:—

(a) The depolarisation of the Hg lines increases considerably when mixed with excited cadmium atoms.

(b) The depolarisation increases with increasing transverse magnetic field, and in a field of 100 Gauss the depolarisation seems to be complete.

B. N. GHOSH.

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Patna,
June 12, 1941.

AN IMPROVED METHOD FOR THE DETERMINATION OF "PROTHROMBIN TIME"

Quick¹ has described a method for evaluating 'prothrombin time' by noting the time-interval for the formation of a clot in the plasma when it is mixed with a solution of thromboplastin and calcium. The procedure may be briefly represented as follows:—[See (A).]

(A) 0.1 c.c. Plasma + 0.1 c.c. Thrombo-plastin sol. + 0.1 c.c., 0.1 M. CaCl₂, ———
(oxalated) (prepared from rabbit's brain)
————> Appearance of clot (Prothrombin time) = 12 to 13 seconds.

(B) 0.2 c.c. Plasma + 0.2 c.c. Russel Viper Venom + 0.2 c.c., 0.025 M. CaCl₂, ———
(oxalated) (1-10,000)
————> Appearance of clot (Prothrombin time) = 18 to 25 seconds.

'Prothrombin time' obtained by this method has often yielded divergent results and minor modifications in the details of the technique have therefore been recommended by Dam,² and Kato and Poncher,³ with a view to obtain

more uniform and dependable results. However, apart from the technical difficulty of observing accurately the end-point (formation of the fibrin web in a rather opaque solution provided by the rabbit-brain extract), the chief disadvantage of Quick's technique in routine determinations lies in the fact that a fresh thromboplastin preparation has to be obtained every time that a determination is made—a procedure which is not only inconvenient and time-consuming, but is open to the objection that the thromboplastin preparation employed in the reaction, being freshly made each time, may and actually does, vary in potency from batch to batch. In a standard technique, on which the interpretation of data of diagnostic and prognostic value will depend, such variation in potency of a reaction component is obviously not desirable, and may give misleading results.

Taking advantage of the thromboplastic property of Russel Viper Venom, Fullerton⁴ has recommended a modified method wherein the thromboplastin preparation from rabbit's

brain extract is replaced by a solution of Russel Viper Venom of standard strength. [See (B).]

The author recommends that every time a prothrombin test is performed, an ampoule

containing viper venom (0.1 mg.) in dry form (commercially available as "Stypven" or "Rus-sven", B.W. & Co., or Bock's Pure Drug Co.) should be dissolved in 1 c.c. distilled water *immediately before use*. The viper venom in solution, according to the author, is liable to rapid deterioration.

Hobson and Witts⁵ have recently reported that the Fullerton technique, while an improvement on the original Quick procedure, is still not quite satisfactory. When viper venom *alone*, even in its optimum concentration of 1-20,000, is used as the thrombokinase in the reaction, the clotting time obtained is often very much delayed (18 to 25 seconds instead of 12 to 13 seconds by the Quick method) and the range of variation is also liable to be wider than usual. To obviate these difficulties, the authors have suggested the addition of *lecithin* to the venom solution. [See (C).]

(C) 0.1 c.c. Plasma + 0.1 c.c. R.V. Venom-*lecithin* reagent + 0.1 c.c. 0.025 M. CaCl_2
(*lecithin* 5 mg./c.c. venom)

————> Appearance of clot (Prothrombin time) = 8 to 11 seconds.

(D) 0.2 c.c. Oxalated plasma + 0.2 c.c. R.V. Venom (1-20,000) in 0.025 M. CaCl_2 ———
(kept at a temp. of 37°-38° C.) (from stock solution)

————> Appearance of clot (Prothrombin time) = 8 seconds.

While working on the relationship between plasma trypsin and blood coagulation, it was necessary to determine the 'prothrombin time' in a number of physiological and pathological conditions as a preliminary to further work. After many trials with both the Quick (A) and the Fullerton (B) techniques, it was realised that there is considerable room for the improvement of this useful clinical test. Experience with the Fullerton technique indicated that the method would yield quite satisfactory results, if the dilution of the prothrombin in the plasma could be reduced and the speed of the thromboplastin-prothrombin-calcium reaction accelerated. It was found that both these problems could be solved by adding *directly* to the plasma 0.2 c.c. of 1 in 20,000 venom solution in 0.025 M. CaCl_2 as shown below:—[See (D).]

The total volume of the reaction mixture was thus reduced to 0.4 c.c. [instead of 0.6 c.c. when

the thromboplastin and calcium solutions were added separately as in (B)], thereby resulting in an increase in concentration of prothrombin in the reaction mixture by about 33 per cent. A further improvement was rendered possible when it was discovered that, contrary to previous conceptions, a solution of viper venom (1 in 20,000) in water or in 0.025 M. CaCl_2 can be maintained under stable conditions under toluene at a temperature of about 5° C. A stock solution of venom can therefore be used in prothrombin determinations instead of a fresh solution prepared from dry venom for each test, as is demanded by the Fullerton (B) technique. The simultaneous addition of thromboplastin and calcium further brings down the clotting time to 8 seconds, thus making it unnecessary to add *lecithin* to the venom solution, as recommended by Hobson and Witts (C).

The advantages of our method may be briefly stated as follows:—

- (a) It permits the employment of a stable stock solution of thromboplastin of constant potency. In routine testing of a large number of samples, the availability of a ready-made standardised thromboplastin solution is often a real advantage.
- (b) The addition of thromboplastin and calcium in one solution abolishes the time-interval of the thromboplastin-prothrombin reaction, which can take place only in the presence of calcium.
- (c) The 'Prothrombin time' is speeded up on account of the increased concentration of prothrombin in the reaction mixture.
- (d) The clot formed is well marked, as the fibrinogen is not diluted to the same extent as in Fullerton's method.

Since the isolation of Vitamin K and its therapeutic utilisation in certain hæmorrhagic conditions, the determination of the prothrombin level in blood has attracted considerable attention. The improved method for the determination of 'Prothrombin time' outlined here will, it is hoped, be found of particular interest

to clinical hematologists and other laboratory workers.

The details of this investigation will appear elsewhere. Our thanks are due to Colonel Sir Ramnath Chopra for his encouragement and guidance.

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June 18, 1941.

¹ Quick, *J. Amer. Med. Assn.*, 1938, **110**, 1658.

² Dam, Tage-Hausen and Plum, *Lancet*, 1939, **2**, 1157.

³ Kato and Poncher, *J. Amer. Med. Assn.*, 1940, **112**, 749.

⁴ Fullerton, *Lancet*, August 17, 1940, 195.

⁵ Hobson and Witts, *Lancet*, Aug. 24, 1940, 247.

THE INHIBITORY EFFECT OF EXCESS OF CALCIUM ON QUICK'S PROTHROMBIN TIME

In the course of our attempts to determine the prothrombin time in healthy adults and in certain clinical conditions, we noted that the prothrombin time was definitely and consistently longer when the calcium chloride solution used was a M/10 solution, instead of M/40 solution, recommended by Quick and Leu.¹ We were led to suspect an inhibitory action of a moderate excess of calcium as a result of a series of observations made in October 1940 (Table I).

TABLE I

Subject	Prothrombin time in seconds	
	M/10 solution	M/40 solution
1. D.M. H.M. 28	50	15
2. K.S. H.M. 16	60	22
3. V.A. H.M. 15	59	17
4. S.A. H.F. 28	42	14
5. N. H.M. 50	45	16

On looking into the literature on the subject we came across a few and vague statements regarding the inhibitory action of excess of calcium on blood coagulation. Ferguson² states that a number of authorities have demonstrated the anti-coagulant effects of calcium salts. He refers to the experiments of Horne,³ confirmed by Sabbatini, which showed that clotting was inhibited by an excess of calcium. Mellanby⁴ and Rettger⁵ also confirmed Horne's observation. Fergusson points out, however, that the question has not been fully elucidated and that excess of any neutral salt, preserves the fluidity of the blood. Von Zarday,⁶ restudied the *vitro* optima, minima and maxima for both calcium and citrate in blood coagulation, and showed that the anticoagulant effects of excess of calcium could be overcome by the subsequent addition of citrates.

Quick⁷ observed that, while calcium was essential for clotting, a moderate excess of calcium inhibited the effect. "The optimal concentration of calcium for clotting oxalated plasma is M/100 to M/70. On increasing the calcium concentration above this level clotting is inhibited." One of his recent papers⁸ entitled "Calcium Factor in Quantitative Determination of Prothrombin" is not locally available. His latest contribution on the subject⁹ contains the following observations and views. "By mixing plasma containing a fixed excess of oxalate with thromboplastin and then adding calcium chloride solution, optimal coagulation was obtained for a wide range of calcium concentrations as shown in Table IV. Theoretically, a calcium chloride concentration of 0.0075 M will precipitate all of the oxalate contained in the plasma, but curiously a concentration as low as 0.00065 M is still able to cause clotting. From 0.0025 to 0.025 M the clotting time is fairly constant and corresponds rather closely to the rate observed after adding thromboplastin to plasma containing no anticoagulants. This suggests that for these concentrations of calcium, the prothrombin is quickly and completely regenerated and will cause clotting in the period normally observed

for a fixed amount of prothrombin. Naturally, for low or inadequate amounts of calcium not all of the prothrombin can be reformed. For higher levels of calcium the depressing action of this ion begins to manifest itself."

In reply to our letter written in October 1940, mentioning our findings and requesting his comments, Professor Quick replied in the last week of February this year. "In regard to your first observation, calcium chloride beyond a certain concentration depresses coagulation. I think this observation is linked with the fact that prothrombin itself is a calcium compound and that the remainder of the calcium of the blood is not needed for coagulation. (I am sending you a reprint on this subject.)" The reprint, eagerly awaited, has not reached us yet.

We therefore felt it desirable to reinvestigate the question. Quick's test was performed using eight different concentrations of calcium chloride solution. The results presented in Table II confirm our early findings, regarding the inhibitory action of a moderate excess of calcium on Quick's test.

TABLE II

Quick's Prothrombin time in seconds with different concentrations of Calcium Chloride Solution

Subject	M	M	M	M	M	M	M	M
	5	10	15	20	30	40	80	160
K.V. ..	80	35	25	22	19	17	17	17
M.S. .	130	39	31	24	20	19	19	10
B.Ch. ..	140	43	29	23	23	21	21	21
K.S. ..	122	37	27	25	21	16	18	17
D.P. ..	108	46	31	24	22	20	19	20
A.P. ..	115	47	31	23	21	20	20	..

Whatever may be the theoretical explanation for the above findings, we feel justified in publishing our results with a view to stimulate

further work on this very important but neglected question.

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Department of Physiology,
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Vizagapatam,
May 15, 1941.

¹ Quick, A. J., and Leu, H., *J. Biol. Chem.*, 1937, **119**, 81.

² Ferguson, J. H., *Physiol. Rev.*, 1936, **16**, 640.

³ Home, R. M., *J. Physiol.*, 1896, **19**, 356. Quoted, by Ferguson.

⁴ Mellanby, J., *J. Physiol.*, 1908-09, **38**, 28, 441. Quoted by Ferguson

⁵ Rettger, L. J., *Am. J. Physiol.*, 1909, **24**, 406. Quoted by Ferguson.

⁶ Von Zarday, I., Quoted by Ferguson.

⁷ Quick, A. J., *J. Immunol.*, 1935, **29**, 87.

⁸ —, *Proc. Soc. Exper. Biol. and Med.*, 1939, **40**, 206.

⁹ —, *Am. J. Physiol.*, 1940, **131**, 455.

AIR TEMPERATURES GIVEN IN METEOROLOGICAL REPORTS COMPARED WITH THOSE ON THE FIRST FLOOR OF A BUILDING AT POONA

THERMOMETERS at all meteorological observatories in India, are exposed in a Stevenson Screen with its bottom at a height of 4 ft. above ground. The temperature registered by these thermometers is that experienced by persons who live and work in the open without exposure to direct sunlight during the day or to sky radiation at night. But people spend most of their time indoors, especially in towns, and the temperatures to which they are exposed are generally more equable than in the open.

This note gives the results of a comparison for one year between the temperatures obtained under standard conditions at the Poona observatory and the temperatures on the first floor of the Poona Meteorological Office building.

A thermograph by Casella is kept on a table on the first floor landing near a broad door

leading to the balcony. The landing is continued on either side in the front verandah of the building, which is screened from the outside by mosquito-proof wire-netting. The thermograph is at a height of $3\frac{1}{2}$ ft. above floor level and 21 ft. from the ground. The Stevenson Screen is situated in the compound of the Office at a distance of about 200 ft. from the building.

The daily values of maximum and minimum temperatures for a single year 1938 were tabulated from the thermograms. The readings of the thermograph were compared twice a month with those of an Assman thermometer.

The monthly mean values of the maximum and minimum temperatures on the first floor together with the differences from the corresponding monthly means of temperatures in the Stevenson Screen are given in Table I.

As may be expected, the air inside the building is cooler during day and warmer during

night, the contrasts being greater in the case of the minimum than in those of the maximum temperatures. The differences are least in the monsoon season and greatest in winter and spring.

The diurnal range of temperature inside is similar to that outside in its annual variation. The range is least in June-July and greatest in February-March; and the magnitude of the diurnal range is much smaller inside; on the average of the year it is only 7° F. inside as against 24° F. outside.

The highest maximum and the lowest minimum recorded on both the sites in each month are given in Table II.

The tabulations also show that the differences between the inside and outside retain the same sign day after day although differing in magnitude. On rare occasions in the rainy season the maximum inside is found to be higher than the maximum outside when a sudden shower

TABLE I

First Floor.—Monthly means of max. and min. temperature ($^{\circ}$ F.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Maximum temperature	77.3	78.5	87.2	90.4	88.5	80.0	78.4	78.5	79.4	78.6	76.7	74.9	80.7
Difference .. (S.S.—1st Floor)	+12.1	+10.6	+10.8	+10.2	+ 8.0	+ 2.6	+ 2.4	+ 3.8	+ 5.1	+ 6.9	+ 9.7	+10.1	+ 7.7
Minimum temperature	68.6	68.2	76.9	80.6	80.0	77.6	76.0	76.0	75.9	73.9	69.3	65.5	74.0
Difference .. (S.S.—1st Floor)	-13.0	-15.8	-13.5	-10.6	- 7.8	- 5.2	- 4.7	- 5.2	- 6.7	- 9.1	-12.7	-14.4	- 9.9

TABLE II

Highest max. temperature ($^{\circ}$ F.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1st Floor	80	84	92	94	94	87	82	82	85	82	82	78
S.S.	95	95	102	105	104	94	88	89	92	91	89	91

Lowest min. temperature ($^{\circ}$ F.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1st Floor	67	64	72	76	78	76	74	74	74	72	65	61
S.S.	51	45	55	58	65	68	69	69	65	54	45	43

at about the time of the maximum temperature cools the outside air.

V. DORAISWAMY IYER.

Meteorological Office,
Poona,
May 26, 1941.

ANALYSIS OF THE OIL OF ZIPHIUS CAVIROSTRIS (GOOSE-BEAKED WHALE)*

IN July 1940, a member of the Ziphiidae, identified as *Ziphius cavirostris* at the Fisheries Department, Colombo, was washed up alive on the west coast of Ceylon at Ratmalana. Specimens of this animal have been reported previously¹⁻⁶ but no analysis of the oil of this very rare Cetacean appears to have been carried out. It was therefore considered of

the facilities afforded to me in the Laboratory of the Fisheries Department.

N. G. BAPTIST.

Fisheries Dept. Laboratory,
Ceylon,
June 26, 1941.

* (From the Laboratory, Fisheries Department, Ceylon.)

¹ Longman, *Proc. Roy. Soc.*, 1919, Qld. 31, 90, pl. iii and iv (near Maryborough, S. Qld.)

² Olivier, *Proc. Zool. Soc.*, 1922, p. 576.

³ Dammerman, *Treubia*, 1926, 8, 336, pl. iii (N. coast of Java).

⁴ Vinciguerra, *Ann. Mus. civ. St. Nat.*, Genova, 1927, 52, 232 (Ligurian Sea).

⁵ Scott and Lord, *Proc. Roy. Soc.*, Tasmania, 1928, p. 156 (Preservation Island, Tasmania).

⁶ Hale, *Rec. S. Austr. Mus.*, 1931, 4, 312 (New Ireland).

⁷ Hilditch, *Fats and Waxes* (1927).

Sp. Gr.	Ref. Ind.	Sap. No.	Sap. Eq.	Iodine abs. %	Free F. A.		Non-sap.
					Acid No.	As Oleic acid	
<i>Ziphius</i> Head oil 0.904 ^{29.0/29.0}	1.568 ^{28.0}	235-240	234-238	26	1.2	0.61%	14.7%
Body oil 0.926 ^{29.0/29.0}	1.384 ^{28.0}	113	496	50	20	10.1%	8.3%
Dolphin ⁷ Jaw oil 0.925 ^{15.0/15.0}	1.452 ^{26.0}	270-290	195-205	32	2.4	1.2%	fairly high
Body oil 0.927 ^{15.0/15.0}	1.471 ^{26.0}	187-220	255-300	100-127	2-12	1.6%	..
Sperm Whale ⁽⁷⁾ Head oil 0.878 ^{25.0/27.0}	1.459 ^{25.0}	140-144	390-405	60-76	3-8	15.5%	39.43
Body oil 0.876	1.462 ^{25.0}	122-130	430-460	88-93	2 4	1.2%	33.44

interest to record the analytical characteristics of the oil from this mammal.

The only sample of "body oil" obtainable was from a piece of blubber which had been left in an open dish for three days and from which the oil had drained away. Unfortunately rancidity had set in. The values obtained are given below; and for comparison, the analytical characteristics of Dolphin oil are also provided.

I must thank the Director of Fisheries for

A LONG-GLUMED MUTATION IN RICE

GENERALLY speaking the cultivated varieties of rice, *Oryza sativa* L., possess minute outer glumes measuring from 1.5 to 3 mm. Even the wild rice, characterized by complete shedding of grain, has very small glumes. However, there are certain varieties of *O. sativa* whose glumes are longer, extending up to the upper limits of lemma and palea. In certain of such varieties the glumes are even longer than the spikelets. These are

mentioned by Roschevitz¹⁰ as *Oryza sativa* L. var. *longiglumis* Roshev., in contrast to a distinct species, *O. grandiglumis* (Doell.) Prod., in which the outer glumes are as large and wide as the lemma and palea.

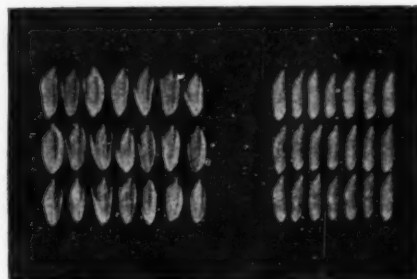
Among the varieties of *O. sativa* the character of long glumes, although morphologically distinct, has not been utilized uniformly by various workers who have made attempts at classification of the innumerable varieties of common rice. Thus, to mention some, Kikawa,⁶ Graham³ and Beale¹ do not utilize the character in their classification of rice, while Tanaka,⁶ Hector and Sharangpani⁴ and Kashiram and Chetty⁵ have used long outer glumes as one of the characters for classification.

Inheritance studies so far reported show that the long-glumed condition is usually recessive. Okada,⁷ van der Stok¹¹ and Parnell *et al.*⁸ each reported dominance of short glumes and a monogenic segregation 3 short : 1 long-glumed plants. Chao,² however, found a 15:1 ratio of the two types of plants respectively. In contrast to these results Ramiah *et al.*⁹ reported a 1:2:1 ratio of short, intermediate and long glumed plants respectively. These authors illustrate the middle class from almost a short-glumed to a long-glumed condition in which the glumes are of varying lengths, but do not exceed the length of lemma and palea. In the third category the glumes extend out over the spikelet, like the original long-glumed parent. Since the F_1 is intermediate, it is rightly concluded by them that the character of long-glumes is partially dominant.

In the Bombay Province, out of many hundreds, only two varieties with long-glumes, Pankhali-Kamod and Rakkibhatta, are known to us. The former is grown in Gujarat and is scented, while the latter comes from Karwar in the southern portion of the Province.

During the crop season of 1940, while making individual plant selections from a bulk sample of an early local Kolamba variety, a plant with long glumes was observed. Since all other plants from the variety had the usual short

glumes, the off-type plant was either a mechanical mixture, a natural hybrid or a mutation. From the shape of its grains, it was clear that no mechanical mixture of such an off-type plant could occur as there is no such variety of Kolamba in existence. This also rules out the possibility of a natural cross. Therefore, it appeared a case of a mutation (Fig. 1).



Long Glumed

Normal

FIG. 1

Twenty seeds from the off-type plant were grown in a pot during the winter of 1940 to observe the breeding behaviour of the long-glumed Kolamba plant. Of these, 18 plants showed spikelets with long glumes, while two plants did not put forth any panicles. It is, therefore, certain that long-glumed condition in this new type of Kolamba arose due to mutation.

Kolamba is one of the most important, fine-grained variety in the northern districts of Konkan, which is the predominant rice tract of the Province. The Agricultural Department in Bombay has released a number of superior strains from this variety. Some of these are replacing even the coarser early and mid-late varieties. Since Kolamba strains are entirely green in vegetative parts, there is no outstanding discriminating character, except differential flowering, which helps to distinguish them from local coarse varieties. If such a conspicuous character as long glumes could be introduced without impairing any of the agricultural characters of the improved Kolamba strains, it would greatly help to rogue the

fields and will also assist in keeping an accurate record of the areas under improved strains of this variety.

B. S. KADAM.
M. V. GADKARI.
G. G. PATIL.

Rice Breeding Station,
Karjat,
June 25, 1941.

¹ Beale, R. A. *Agric. Res. Inst. Pusa Bull.*, 1927, **167**, 1-14.

² Chao Lien Fang, *Genetics*, 1918, **13**, 133.

³ Graham, R. J. D., *Mem. Dept. Agri. Ind. Bot. Ser.*, 1914, **6**, 209.

⁴ Hector, G. P., Sharangpani, S. G., et al., *Ind. Jour. Agri. Sci.* 1933, **4**, 1.

⁵ Kashiram and Sarvayya Chetty, C. H., *Ind. Jour. Agri. Sci.*, 1934, **4**, 618.

⁶ Kikawa, S., *Imp. Uni. of Tokyo*, 1912, **3**, 1.

⁷ Okada, K., *Rept. Jap. Agri. Assoc.*, 1910, **354**, 1.

⁸ Parnell, F. R., Rangaswami Ayyangar, G. N., and Ramiah, K., *Mem. Dept. Agri. Ind. Bot. Ser.*, 1917, **9**, 75.

⁹ Ramiah, K., Jobitharaj, S., and Dharmalinga Mudaliar, S., *Mem. Dept. Agri. Ind. Bot. Ser.*, 1931, **18**, 229.

¹⁰ Roschevitz, R. J., *Bull. App. Bot., Genetics and Plant Breeding (Russian)*, English Summary, 1931, **27**, 119.

¹¹ Stok, van der J. E., in *Handbuch der landwirtschaftlichen Pflanzenzüchtung*, by C. Frowirth, Berlin, 1923.

THE STRUCTURE OF THE CHROMOSOME

WHILE our understanding of nuclear structure has made rapid strides of advance, there still remains a sharp cleavage of opinion on the question of the structure of the chromosome. Undoubtedly a large measure of this difference is due to the peculiar temptation of some cytologists to deny the validity of visual observation. With improved methods of fixation and staining, Professor Gates and his students have, in recent years, gathered overwhelming evidence in support of the view that the somatic anaphase chromosome is bipartite. Dr. Darlington¹ faces this mass of observational evidence with a bubble theory which in reality is a revival of a conception prevalent in 1911 that anaphase and telophase chromosomes developed vacuoles or alveoli in passing into the resting condition,

Observations on the satellites during somatic mitosis have yielded further crucial evidence in support of the double nature of the somatic anaphase chromosomes. In root smears of *Crocus sativus* stained with decolourised basic fuchsin, Gates and Pathak² found during telophase, one of the three satellite chromosomes bipartite with a split satellite.

In the course of my investigations on the somatic chromosomes of the Liliaceous genus *Muscari*, I have found in root smears, cases in which the satellites of one of the anaphase chromosomes was split, demonstrating unmistakably its double nature. One such anaphase is figured here and the long arm of one chromosome can be seen to bear a split satellite at its end, the threads diverging widely apart. This chromosome has a prominent secondary



FIG. 1

Root smear of *Muscari moschatum*

Anaphase showing one of the long chromosomes with a split satellite. $\times 3600$.

constriction in the long arm. The split condition of the satellites does not appear often as it depends on critical fixation and the orientation of the chromosome.

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Department of Botany,
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Bangalore,
June 14, 1941.

¹ *Nature*, 1938, **141**, 371.

² *Ibid.*, 1938, **142**, 156.

NOTE ON THE ORIGIN OF THE
MAGNETITE DEPOSITS OF
MAYURBHANJ STATE, ORISSA

THE magnetite deposits of Dhalbhum (a subdivision of the Singbhum District of Bihar) and Mayurbhanj attracted considerable attention from Geologists after the presence of the valuable metal vanadium in these ores was proved by Ray¹ and later confirmed at the Imperial Institute. Dunn and Dey² described briefly the petrographical characters of the basic and ultrabasic rocks with which the ore bodies are associated, and discussed their genesis. According to them the magnetite deposits are due to the breakdown of the previously crystallised iron-rich olivines and pyroxenes by the action of the residual solutions, the MgO of which replaced the FeO of the ferromagnesians by base exchange. The authors are of the opinion that the 'alteration of the titaniferous pyroxenes and olivine was quite capable of supplying all the iron and perhaps titanium, which then separated out as titanomagnetite'. A necessary corollary of the enrichment of the residual solutions in FeO by the above process is considerable alteration of the associated rocks, such as serpentinisation, urallitisation and chloritisation of ferromagnesians, saussuritisation and chloritisation of feldspars, albitisation of feldspars, etc.

During the past three years the writer of the present note has been making a thorough and systematic study of the basic and ultrabasic rocks of Mayurbhanj and so far as the latter area is concerned his observations do not confirm the above explanation. No doubt the rocks have undergone deuteric alterations in many places but the magnetite deposits do not show any genetic association with altered rocks. The gabbro rocks range from anorthositic to noritic. The chief minerals of these rocks are plagioclase feldspars of the composition of labradorite, orthopyroxene of the Bushveld type and ordinary orthopyroxene (both enstatite and hypersthene), clinopyroxene, hornblende, olivine, biotite, apatite, quartz and magnetite. Magnetite is of two generations,

the later and more important deposition was clearly the last mineral to crystallise as has been noted by Dunn and Dey.

It may be noted in this connection that orthopyroxene of the Bushveld type which consists of lamellar intergrowths of clinopyroxene in orthopyroxene host has been noted by the writer of this note for the first time in these rocks. This mineral has not been recorded in any of the orthopyroxene bearing rocks of India, as the intergrowths, which are due to exsolution of diopside, are destroyed during recrystallisation. Magnetite of the second generation is widely disseminated in these rocks and not only fresh rocks are more common than altered rocks but also magnetite deposits, both small and large, do not show any associational relationships with the altered rocks. Certain rocks may be described entirely as 'magnetite-rich facies' of the anorthositic. The study of thin sections reveals that the magnetite has replaced feldspars and pyroxenes in these gabbros. It fills up the interstices between the already crystallised minerals and encroaches upon their margins, sometimes entirely replacing them.

The mode of occurrence of the magnetite and its widespread distribution in fresh rocks indicate that it is of primary magmatic and high temperature metasomatic origin as has been recently suggested by Alling³ for the Adirondack magnetites. Moreover the gabbro rocks are rich in MgO as is to be expected from their richness in early crystallised pyroxenes, but this is against the requirement of the theory of base exchange.

Primary micropegmatite has been noted in the gabbro in a few localities far away from the exposures of Singbhum granite and granophyre, the micropegmatite of which, at least in this area, is of secondary cataclastic origin. This, together with the unmetamorphosed nature of the striped orthopyroxene bearing gabbro, points to its younger age compared to the age of the granite-granophyre.

The detailed and full account of these rocks will be published shortly when the evidences

for the above conclusions will be fully discussed and the petrology of the rocks fully described.

S. C. CHATTERJEE.

Ranchi,
June 30, 1941.

¹ *Proceedings of the 19th Indian Science Congress, 1932, 212.*

² *Transactions, Mining and Geological Institute of India, 1937, 31; Memoir Geological Survey of India, 49, Part 1, 215-216.*

³ *Economic Geology, 1939, 34, p. 166.*

A MARGOSA TREE WITHOUT THE BITTER PRINCIPLE

At Kothanur village, 13 miles to the northeast of the Kollegal town in the Coimbatore District, there is a big banyan tree (*Ficus bengalensis* Linn.) which has a spread of nearly three-fourth acre enclosing within its trunk a large margosa tree (*Azadirachta indica* A. Juss.) of about 60 feet in height and 18 inches in diameter. The margosa overtops the banyan at its summit. The aerial roots of the banyan tree would have entwined the margosa tree to start with, as is commonly met with in combinations of the banyan with other species and after many years' growth would have formed a natural graft with the main stem of the margosa. The enclosed portion is about 10 feet in height and the trunk of the margosa tree cannot be seen to this height from the base. At this height a stout aerial root of the banyan tree is found to grow into a hollow in the trunk of the margosa tree caused by some decay in its heartwood; to all appearances the basal portions of both the trees have fused into one another. Evidently stem fusions have taken place in many places between the margosa tree and the banyan tree helped by the pressure exerted by the banyan.

The peculiarity of this margosa tree is the absence of the bitter principle in its leaves. The writer tasted them and some specimens of leaves brought by him to Coimbatore were declared by all who tasted them to be without the bitter principle found in margosa leaves.

The only plausible explanation for this peculiar phenomenon is that in many places the vessels and the sieve tubes of the margosa may have fused with those of the banyan as a result of "grafting" and the sap of the banyan is influencing the sap of the margosa.

Many seedlings of margosa from seeds fallen from this tree are growing under the parent tree; the leaves of these seedlings are normal and contain the usual bitter principle. The natural inference is that the absence of the bitter taste in the leaves of the margosa growing in combination with the banyan is not a genetic modification but merely the influence of the sap of the banyan on that of the margosa. Here is probably an extraordinary case of the influence of an unnatural stock (the banyan tree) on a scion (the margosa). It is interesting to note that such grafts could take place in nature between two widely different families of plants, i.e., between banyan, a member of *Moraceæ* and margosa, a member of *Meliaceæ*.

These "fused trees" have become very famous in the locality and the neighbourhood. People attribute strange powers to this combination especially to the margosa due to the absence of the bitter principle in its leaves. Offerings are made by villagers to this unusual margosa tree on Mondays and Fridays.

K. CHERIAN JACOB.

Agricultural Research Laboratory,
Coimbatore.

REVIEWS

Man on His Nature—*The Gifford Lectures*, Edinburgh, 1937-38. By Sir Charles Sherrington, O.M. (Cambridge University Press), 1940. Pp. 413. Price 21sh. net.

This book embodies twelve lectures, which form a comparative study of the modern biologist's attitude towards the mysteries of life and the views propounded by Jean Fernel, a physician philosopher of the sixteenth century. His work "On Hidden Causes" printed in 1548 was one of the most widely read books of the time, judged by the number of editions it passed through. Its reputation and popularity must have been largely due to the fact that it was a clever and fairly comprehensive exposition of some of the obscure philosophical and theological problems which agitated the mind of Christendom. It is only natural that Sir Charles Sherrington, whose whole life has been spent on the detailed investigation of the structure and function of the nervous system, should have made Fernel's work the text for his lectures. They deal with independent topics and can be read without a previous knowledge of the earlier discourses, but yet together they constitute a composite dissertation on the fundamental theme whether the modern scientific researches justify a logical division of matter into living and non-living bodies. Firm in the grasp of his subject and with an outlook rare in its sympathy and range, the author has striven to prove that the boundary line separating the sentient and the non-sentient objects is only apparent, but at bottom the biological processes are indistinguishable from the complex of interatomic physical and chemical electrical changes.

Every student of biology is aware of the competing claims of the mechanistic and vitalistic theories offering solution to the mystery of life, which, in spite of the immense advances in biology and physical sciences in recent times, still remains a deep mystery. It must be remembered that all theories and hypotheses,—more or less in the nature of accretion of analogies,—are not all inferences from positive knowledge, but to a very large extent must be "correct

guesses". If nothing is to be gained by claiming living matter as colloidal, there is equally nothing to be gained by claiming that life processes belong to the province of atomic physics. The mystery of life is just as great now as it was to the first speculator, for the obvious reason that a "subject" in the philosophical sense cannot be also an "object". We may know all about the physical machinery, but when we come to analyse "consciousness" and "mind", we needs must enter the region of speculation, for neither the one nor the other can be seen and handled, except what we know of their manifestation. Pasteur has been called a vitalist, but in 1884 he wrote "not only have I not set up as absolute the existence of a barrier between the products of the laboratory and those of life, but I was the first to prove that it was merely an artificial barrier, and I indicated the general procedure necessary to remove it by knowing that it would be necessary to have recourse to those forces of dissymmetry which you have never employed in your laboratories". Sir William Bate Hardy adds "and yet the hypothesis of a special vital force and the search for it is as likely to lead to our goal as any other. I would even go further and say that the physical and chemical improbabilities of living matter are so great as to make an hypothesis of special creations more restful and almost as valid as that of continuous evolution."

We have read the lectures with profound interest, but nevertheless we cannot disguise from ourselves the feeling that "the biologist's philosophy" so fearlessly and invigoratingly expounded in them leaves a sense of incompleteness. This is not due to any want of adequacy and clarity of treatment, for few books can be regarded as more clear, and comprehensive, or fuller in respect of experimental details supporting the arguments. It is the very nature of the subject that must baffle ultimate analysis. We may succeed in finally reducing the concept of life as a mere convention, but can we also treat consciousness and mind,—the two "functions" of life,—as mere phases of physical phenomena. "Is there any guess which comes within whooping distance of

the shifts and tricks by which the primordial slime clothed itself in diffraction gratings to give the birds the colour they need in a tropical forest?" The inner sanctuary of biology may not open its doors,—perhaps not at all,—by uttering the physico-chemical barley, wheat, but possibly a glimpse into the inner treasure vaults may be vouchsafed by Upanishadic sesame.

The twelve lectures deal with topics such as Nature and Tradition, The Natural and Superstition, Life in Little, The Wisdom of the Body, Earth's Reshuffling, A Whole Presupposed of its Parts, The Brain and its Work, The Organ of Liaison, Brain Collaborates with Psyche, Earth's Alchemy, Two Ways of One Mind and Conflict with Nature—thus traversing the whole field of known facts in science, physical, biological and mental. On going through the chapters, we are tempted to exclaim the excellent sentiments so nobly expressed by the author, "There will be much to which man has not access. The distances are immense and he is near-sighted. He peers into a small patch and what he sees there he submits to his reason which after all is very newly hatched. What wonder if his conclusions be meagre and insecure. What wonder they are narrowly anthropomorphic. Such they must be." The central point of enquiry is, "Is there a Mind that directs and controls the operations of organic and inorganic Nature." If there is none, then it is arguable that the boundary line separating Nature and Mind vanishes; in the sense that Mind is self-conscious and conscious of the electrical-chemical forces by which matter exists, Mind and Nature are different. But are these "forces" blind, fortuitous and independent? They are known to be governed by definite laws expressed mathematically or in the language of physics and chemistry. These are the Laws of Nature. But what is Nature? Is it the assemblage of phenomena in the objective world, does it also comprehend the subjective world? We are aware that the mental phenomena are to a large extent—the purposeful and directed phenomena—governed by intelligence. Is there an intelligence controlling the forces and phenomena of the objective world? Perhaps a tentative answer is furnished by the query—not an impertinent one,—is the book under review, undoubtedly a remarkable

event, just a product of atomic physics and chemistry, or have the operational processes culminating in the book been guided, directed and controlled by a purposeful intelligence? Sir Charles Sherrington has answered this and other intricate questions in his own inimitable way.

This book has brought together several provocative thoughts, has analysed them and shown the many inherent difficulties confronting the enquiring mind. Most of its contents are stimulating and easy to digest. None can read the volume without the sense that Sir Charles Sherrington has felt the grand sweep and majesty of the theme which he has set out to expound in a firm, clear and crisp style, so rare in scientific treatises dealing with philosophical problems. We have the intense conviction that this book is a masterpiece of balanced exposition of problems which lure and perplex thoughtful minds.

Religion in Science and Civilization.

By Sir Richard Gregory, Bart., F.R.S. (Macmillan & Co., London), 1940. Pp. xii + 366. Price 12s. net.

"The other day I listened with great pleasure to Sir Richard Gregory's Aldred Lecture, and admired once again his instinct for bringing together into the most fruitful association, facts and consequences lying far apart, and extracting wide suggestions and new problems from the assemblage. But the readers of *Nature* do not need to be reminded that Sir Richard was a brilliant editor so that without any sacrifice of its world-wide scientific usefulness he also made this weekly journal a medium of interpretation and understanding between one type of specialist and another and between specialists in general and the man of intelligence and broad curiosity outside the ranks of the specialist worker." H. G. Wells (*Nature*, No. 3729, April 19, 1941, p. 465). These admirable sentiments are not unlike those which a reader of Sir Richard Gregory's sumptuous book would desire to express.

The main thesis of the book is that civilization has progressed on two legs,—Religion and Science,—at first stumbling and righting, but gradually acquiring enough strength to take long and steady strides. Both have the same aim, viz., the investigation of truth, though their methods might differ.

Better appreciation of the service that science and religion are capable of rendering to mankind, though in different spheres, has relegated to oblivion the old and needless controversies, and has led to the realisation that they are complementary to each other. The greatest mistake, that the religious writers and metaphysicians of ancient times made, was to regard their works as final statements of knowledge and what was left for their successors was to repeat them with or without understanding their import. These works acquired or were invested with the authority of Divine revelation and therefore deserved to be respected but not questioned. These sacred books carried with them the seeds of disruption by erecting the word of man as the final authority and when mankind discovered other methods of interpreting the natural phenomena and events, the influence of sacred books must inevitably decline. The blunder we made was that we regarded the knowledge of sacred works as static and that any attempt to question their authority would involve dire consequences. The reign of religion was the reign of tyranny,—the age of suppression of independent enquiry.

Sir Richard Gregory in tracing the cultural history of the different races, has urged that the sacred books and doctrines are to be regarded only as stages in the evolutionary history of human civilization and not as final revelations of truth. The conception of God and the universe which satisfied the primitive people must necessarily appear inadequate to thoughtful men who have explored deeply the mysteries of nature with instruments unknown to the ancient races whose outlook was subjective rather than objective. It is equally untenable to suppose that science has said the final word about the phenomena of the objective world or has rendered a satisfactory explanation of the problems which perplex religion, but the accumulated knowledge of the science of the present century only marks a stage in the development of human mind. Perhaps the task of both religion and science will and must remain a sisyphian role.

Stripped of their dogmatism and their aggressive spirit, religion and science can render invaluable service in the promotion of higher ideals and in the advancement of a higher ethical life based on a spirit of

mutual tolerance, accommodation and understanding. Their gifts are liable to be prostituted and then they both suffer a set-back; their mission is fundamentally peace and progress, and the greatest trouble in the way of both is that the civilization of human mind has not kept pace with material civilization. Lurking deep down behind the mind are the worst passions which often with but mostly without provocation involve nations into the savage un-Christian acts of violence. But it is nevertheless fortifying that mankind is imbued with an inner urge towards truth, righteousness, peace, justice and freedom of conscience.

In the twenty-nine chapters, the reader will find a brief and critical review of the culture history of mankind,—tracing its course and movement chiefly with reference to Mesopotamia and Egypt, with just a passing reference to the sacred literature of India (page 70). The Hindu books, though bulk of them is devoted to levitical practices and rituals, contain sections which accept no final interpretation or dogmatic hypotheses as is evidenced by the establishment of several theological schools. These books may not have adopted the evolutionary principles to religious thought, but offer unlimited scope of original enquiry and it is this spirit that has preserved for them their vitality and spiritual value. The ancient religion of the first settlers in the Indo-Gangetic valley was an enlightened democracy from the standpoint of social needs and the highest expression of human instinct for communion with the Supreme Being from the spiritual point of view. Most religions have the same fundamental basis, but all are vitiated by "approach",—the exercises over which there are conflicts and controversies—we are fed on the husk of religion. We have lost the life-giving grain.

Sir Richard Gregory's greatest service in writing this book is the most laudable attempt to restore to the people the spiritual treasure which they have lost. A book that claims to establish kinship between science and religion must have an abiding interest and those familiar with the writings of Sir Richard Gregory will offer a warm welcome to his latest publication. We have found no trouble in following the trend of thought developed in the twenty-nine chapters and that is probably because our conviction has been that there is absolutely no inherent

antagonism between science and religion. Doubters there must be.

The book represents the high water-mark in the comparative study of religion and science, and is entitled to the highest praise as an illuminating contribution to contemporary thought on human affairs.

Printing Inks, Their Chemistry and Technology. By Carleton Ellis. (Reinhold Publishing Corporation, New York, U.S.A.; Chapman & Hall, Ltd., London), 1940. Pp. 560. Price \$5.00.

There are not very many books in English language on printing inks and for this reason a book on the subject which is of topical interest in India just now is very much welcome.

The book is divided into 18 chapters. The introductory chapter briefly summarises the contents of the entire book.

The second chapter deals with the history of printing inks from 3500 B.C. to the present day and all the advances that have followed with the development of science.

In Chapters 3 to 15 all the methods of manufacturing printing inks and their raw materials are described in great detail, and any one with some knowledge of chemistry should be able to derive a good deal of benefit from the study of such a valuable book.

Problems arising in the manufacture of printing inks are not generally appreciated and Chapter 16 deals with all such problems such as storage and use of printing inks.

The penultimate chapter describes the testing of printing inks which is scattered all over the literature and has not been collected so far except in this book under review.

Lastly, the problem intimately connected with printing work, e.g., the suitability of paper has also been very thoroughly dealt with. In fact the book really and adequately fills the gap that existed in the technical literature.

H. H.

Temperature Measurement. By R. L. Weber. (Edwards Bros., Inc., Ann Arbor, Michigan), 1941. Pp. x + 171.

This book is essentially an experimental study of the subject of temperature measurement. It consists of two parts, the

first part being a concise but clear background for the subject and the second, a course of nearly two dozen comprehensive and practically tested laboratory experiments. The fifteen chapters of the theoretical part cover a little more than the field of temperature measurement including, as they do, the briefly and elegantly written chapters on temperature control, calorimetry, and elementary thermodynamics. Similarly the group of experiments described in the second part is more comprehensive than what the title of this book would indicate. Of the twenty-two experiments detailed herein, only about eleven can be taken as direct temperature measurement exercises while the rest cover the interesting subjects of thermal conductivity, calorimetry and temperature variation of the properties like viscosity and magnetic susceptibility.

The treatment of the subject is concise to a fault, however, but no useful or important topic is omitted. The whole work looks like an elegantly written, comprehensive and orderly arranged lecture notes. The university student will find this a useful companion for the study of this specialized subject and the teacher, a modern and comprehensive scheme of experiments which he could profitably incorporate in the usual curriculum.

The get-up of the book leaves nothing to be desired. The use of typescript and clearly drawn diagrams and illustrations make the reading a pleasure. The whole treatment of the subject is modern and the references are given to the up-to-date literature. Besides a tabulation of all the necessary data in the respective chapters, a set of twelve useful tables is given at the end of the book.

In short, this book can be recommended to all the students and teachers alike who are interested in this branch of physics.

G. G. R.

The Ring Index—A List of Ring Systems Used in Organic Chemistry. By A. M. Patterson and L. T. Capell. American Chemical Society Monograph Series No. 84. (Reinhold Publishing Corporation, New York; Chapman & Hall, Ltd., London), 1940. Pp. 661. Price \$8.00.

In publishing the book under review, the Trustees of the American Chemical Society

Monograph Series, have made a novel departure in a way, in the choice of the subject for a monograph. It is common knowledge that the nomenclature of various types of ring compounds in organic chemistry is often confusing as no standard system of numbering has been adopted in common by chemists all over the world. It is therefore refreshing to find in the present volume all known parent ring systems gathered together and arranged systematically from the simplest to the most complex, for ready reference. The rules and principles on which the nomenclature is based, though appear a little bewildering at the first sight are clearly explained in the introduction and also in the reproduction at the end of the text of an original paper published in the *Journal of the American Chemical Society* by one of the authors (Appendix, pp. 599-611). These will serve also as guide for naming of new ring systems correctly in future. To each system has been given a serial number, facilitating identification in the text. Identifying references to the original literature (as also to Beilstein wherever possible) are given under each heading together with alternative names and systems of numbering. With a little practice it will be found very easy to refer to any required ring system in the text and know all about its nomenclature. The alphabetical index given at the end (pp. 613-61) will also be of great help in finding out any required ring system provided its name is already known. There is little doubt that by publishing this book the authors and the Trustees of A. C. S. Monograph Series have done a really great service to Organic Chemists in helping to standardise their knowledge and to describe new ring compounds in a systematic way. This book should find a place in every chemical library.

P. C. G.

Organic Synthesis, Vol. 20. Charles F. H. Allen, Editor-in-Chief. (John Wiley & Sons, Inc., New York City; Chapman & Hall, Ltd., London), 1940. Pp. 113. Price 10sh. 6d.

The volume under review is the 20th number of the series entitled "An Annual Publication of Satisfactory Methods for the Preparation of Organic Chemicals". It contains details for the preparation of the

following chemicals: (1) β -(3-Acenaphthoyl)-propionic acid, (2) Acetylacetone, (3) 9-Anthraldehyde, (4) *d*-Arabinose, (5) 1, 2, 3-Benzotriazole, (6) 6-Bromo-2-naphthol, (7) *tert*-Butyl acetate, (8) Cysteic acid monohydrate, (9) Decamethylene bromide, (10) Dehydroacetic acid, (11) *trans*-Dibenzoyl ethylene, (12) Dibenzoylmethane, (13) Di- β -carboethoxyethylmethylamine, (14) *a, a*-Dichloroacetamide, (15) Dimethyl-ethynyl carbinol, (16) 5, 5-Dimethylhydantoin, (17) 2, 2'-Dinitrobiphenyl, (18) Diphenylketene, (19) *n*-Dodecyl *p*-toluenesulfonate, (20) Fumaryl chloride, (21) Furylacrylic acid, (22) *o-n*-Heptylphenol, (23) 2-Hydroxy-5-nitrobenzyl chloride, (24) Mandelamide, (25) Methyl β -Bromopropionate, (26) *N*-methylformanilide, (27) Methyl myristate and Methyl palmitate, (28) Monoperphthalic acid, (29) 5-Nitroindazole, (30) Pentaacetyl *d*-glucononitrile, (31) Phenyl Cinnamate, (32) Picolinic acid hydrochloride, (33) *dl*-Serine, (34) Sodium amide, (35) Terephthaldehyde, (36) *a*-Tetralone, (37) 2, 3, 4, 6-Tetramethyl-*d*-glucose, (38) *dl*-Threonine, (39) *dl*-Valine. The index at the end comprises material from this volume only.

Since the appearance of the first member of the series in 1921, the utility and reliability of the details available in these publications have been increasingly appreciated by the chemical world, year after year, so much so that no further comment seems to be necessary.

It is gratifying to note that despite the present war conditions, the Editors and the Publishers have been able to carry on this useful work for the benefit of synthetic chemists, and the appearance of the present volume is now all the more welcome.

The present volume is essentially similar in format, to its predecessors. The only apparent difference is that the title of each preparation, instead of being printed at the top of a fresh page is now printed in continuous running order.

P. C. G.

Physico-Chemical Methods. Volume I. Measurement and Manipulation. Pp. xv + 686. **Volume II. Physical Properties.** Pp. ix + 580. By J. Reilly and W. N. Rae. (Methuen & Co., London). Price £4-4-0.

This well-known work is now in its third edition and this itself is a testimony

to the wide acceptance of a book of this nature. In the present edition the book has been entirely recast and is issued in two volumes with some additional subject-matters such as on High Pressure Technique and Measures and Units, written with the co-operation of specialists in these subjects.

The chemist must to-day be familiar with a large region of facts and methods, which may be called physical or chemical according to one's bias and training. It is difficult to define the boundaries of the knowledges which alone will be of help to him, and yet a certain choice must be made in order to avoid making the book an unwieldy encyclopædia. The avowed object of the book is to emphasise practical physical chemistry from the industrial chemists' point of view, and so there are included sections on drying and evaporating apparatus, high pressure technique, mechanical separation and other separation processes, distillation and similar unit chemical engineering operations. It appears to us that these sections have but a doubtful utility. They are inadequate from a chemical engineering student's point of view, while for a physical chemist they help only to indicate the scope of the subject, although the authors have endeavoured to aid the readers with a list of references for further study. The question is whether a more useful and up-to-date account should not have been given of the variety of present-day physico-chemical methods, such as in the applications of electron tube circuits, absorption spectroscopy, calorimetry, etc. The diagrams are in many instances poor, such for example as those on pages 473, 475 and 477 in Part I. The indexing is also quite inadequate for a book of this professed general utility. In spite of the above suggestions for improvement, the book is a good compendium of the several physico-chemical methods used in the university and technical laboratories, and will be found of great use in any library.

M. A. G. R.

Indian Zoological Memoir VIII—*Hirudinaria* (Indian Cattle Leech). By M. L. Bhatia. (Lucknow Publishing House, Lucknow), 1941. Pp. i-xi + 1-185, with 3 coloured plates and 56 text-figures. Price Rs. 2.

The eighth volume by Dr. M. L. Bhatia of the Lucknow University in the series of the

Zoological Memoirs edited by Prof. K. N. Bahl is a very welcome addition to the volumes already published in this invaluable series of monographs on Indian animals. The Indian Cattle Leech of the genus *Hirudinaria* is studied as a type of leeches in almost all the Universities of India, Burma and Ceylon, but no detailed description of the animal had so far been published. The author has been working on *Hirudinaria* for a number of years, and has published several papers on its anatomy in various scientific journals. In this *Memoir* he gives a detailed account of the anatomy based not only on his own studies extending over several years, but also on a careful scrutiny of all the available literature on the subject. The anatomical accounts are supplemented, in almost every case, by notes on the histology and physiology of the various organs, and in a separate chapter the bionomics and distribution of the leeches as a whole are briefly discussed. As in the case of other *Memoirs* in the series, detailed directions for practical work form the subject of a chapter at the end of the work.

The descriptive account is clear and concise, and is copiously illustrated with beautiful figures specially prepared by the author. Special attention may be directed to the coloured illustrations of the blood-supply and the figures illustrating the structure of the nephridia and the histology of various organs.

The *Memoir* is very well printed and is exceptionally good value for the price. Both the editor and the author are to be congratulated on the publication of this fine monograph, which is sure to prove of great use both to teachers and students of Indian Zoology.

B. P.

Common Marine Food-Fishes of Hong Kong. By G. A. C. Herklots and S. Y. Lin. Second enlarged edition. (University, Hong Kong), 1940. Pp. 89, figs. 51.

This very useful publication deserves special attention of the fisheries departments and marketing officers in this country. In marketing circles, it is well known that the public usually confine their purchases of fish to a very few well-known kinds. The variety of fish available in the tropical waters, fresh, estuarine and marine, is very great, but due to ignorance most of the

people are generally averse to buying even the most nutritious and palatable fishes outside the few with which they are acquainted. To popularize the greater variety of fishes available in the Hong Kong market, the authors have drawn up illustrated accounts of 50 species in English and Chinese and have given 16 European and 18 Chinese recipes for the preparation of dishes from them. The authors state in the introduction that "The fifty species of fish illustrated in this book, and the others also recommended but not illustrated, are all good food-fishes, and the house-wife need not hesitate to buy any one of these even though its shape or colour may appear unusual".

The various parts of the fish referred to in the descriptions are indicated by a labelled illustration and there is a chart showing the seasonal distribution of the 50 species described. By referring to this chart it is possible to find out what fishes are available in different months. The fishes are arranged into five popular groups, namely, Surface Feeders, Perch-like Fish, Croakers, Flat-Fishes and Miscellaneous, and their principal characteristics are noted. A short account is given of the food value of fish and as the flesh of fish deteriorates and decays very much more quickly than the flesh of mammals and birds, useful hints are given about selecting fish in the market. The distinction between fresh and stale fish is tabulated under eight headings and attention is directed to the fact that the white-fleshed fish keep better than the darker-fleshed fish. These latter, oily fish, such as mackerels and herrings, which are highly nutritious, should be eaten absolutely fresh. Directions are also given as to where fish can be purchased at Hong Kong.

Under the description of each fish, its scientific name and an English name are given. The common locally used Chinese names are also included with a romanized form of Cantonese pronunciation. In the description itself attention is directed to the distinctive features of colouration, the general shape and built of the body and to certain peculiarities of structures characteristic of the species. Its normal common size is also noted. Notes on its distribution, seasonal occurrence, retail price and food value are included.

Such a publication is certainly a boon to

the fish-eating population of a town and now that fisheries are receiving some attention in India, it is hoped that the authorities concerned will bring out similar pamphlets suitable for the principal towns, such as Calcutta, Bombay, Madras, Karachi, Lahore, etc. Such guides will encourage the sale of greater varieties of fish and, in consequence, the fishermen will be able to realize better prices for their catches.

S. L. HORA.

The Indian Sugar Industry (1940 Annual). By M. P. Gandhi. (Gandhi & Co., 14/2, Old China Bazaar St., Calcutta). Pp. 276. Price Rs. 4-8-0, foreign 12sh.

Like its forerunners in the previous years, the 1940 Annual is a wide survey of the position of India's great national industry. In spite of the large impetus given by the tariff protection for the industrial expansion, the Indian sugar industry has passed through many vicissitudes during the previous years, culminating in 1940 in an unprecedented severe crisis. This publication describes in detail how unexpected large supplies of cane, the overproduction of sugar by factories, enhancement of the excise duty, the levy of the cane cess in the U.P. and Bihar and the fixation of high minimum for cane prices, brought about a crisis both for the cane-growers and the factory owners with the result that in the U.P. and Bihar large quantities of cane were left in the field and many factories had to work without profits.

This Annual consists of three sections. The introductory part is a good compilation of the relevant portions of the various Acts and control rules passed by the Central and the Provincial Governments and also contains a set of 44 useful statistical tables giving all the necessary information about the progress of the sugar industry. The second section is a detailed survey of the vicissitudes the industry has passed through. The next part is the author's own thesis which describes the various problems confronting the industry and gives a detailed discussion of their solution.

This monograph presents a highly informative reading to all those that are interested in the Indian sugar industry.

G. G. R.

RAMANUJAN—HIS LIFE AND WORK

Ramanujan, Twelve Lectures on Subjects Suggested by His Life and Work. By G. H. Hardy. (Cambridge University Press), 1940. Pp. 230. Price 25sh. net.

PROF. HARDY, as he rightly claims, is the greatest authority on Ramanujan, and any book by him dealing with the life and work of our illustrious compatriot is bound to be an event of unusual importance in mathematical circles. Prof. Hardy had written a memoir on Ramanujan, which was published along with the latter's collected papers. But it was the general belief that this was not enough from one who saw the departed savant and talked with him almost every day for several years, and who stood in a unique relation to "the most romantic figure in the recent history of mathematics". We are glad to see that Prof. Hardy has tried to supply this long-felt want in the book under review. It originated in two lectures given at Harvard on the occasion of its tercentenary conference in 1936. Since then Prof. Hardy has given many lectures on Ramanujan's work to a number of Universities in England and America, and also regular courses at Princeton and Cambridge.

The first lecture deals with Ramanujan's life and career. Prof. Hardy reaffirms with considerable conviction his earlier opinion of Ramanujan's genius; but he also withdraws one or two statements made in the previous memoir which he now considers quite ridiculous sentimentalism. For instance, Prof. Hardy wrote earlier: "He (Ramanujan) would probably have been a greater mathematician if he could have been caught and tamed a little in his youth; he would have discovered more that was new, and that no doubt of greater importance. On the other hand he would have been less of a Ramanujan and more of a European Professor, and the loss might have been greater than the gain." Prof. Hardy refutes this last sentence most strongly, saying that there was no gain at all when the college at Kumbakonam rejected the one great man they had ever possessed, and that the loss was irreparable. This leads him incidentally to pronounce a scathing criticism of our inefficient and inelastic educational system which can fail to recognise the genius of a Ramanujan.

As Prof. Hardy aptly points out, Ramanujan "had been carrying an impossible handicap, a poor and solitary Hindu pitting his brains against the accumulated wisdom of Europe". It should be admitted, however, that in spite of this severe handicap, Ramanujan did beat the accumulated wisdom of Europe in several instances. He was by far the greatest formalist of his time, and one of the three great formalists of all time, the other two being Euler and Jacobi. Prof. Hardy is right when he says: "There have been a good many more important, and I suppose one must say greater, mathematicians than Ramanujan during the last fifty years, but no one who could stand up to him on his own ground. Playing the game of which he knew the rules, he could give any mathematician in the world fifteen."

There are some very good passages in the book which give us a true insight into Ramanujan's character. In one such passage, Prof. Hardy depicts him as a man who, when he was living in Cambridge in good health and comfortable surroundings, was in spite of his oddities, 'as reasonable, as sane and in his way as shrewd a person as any one here'. The picture that the author wants to present to us is "that of a man who had his peculiarities like other distinguished men, but a man in whose society one could take pleasure, with whom one could drink tea and discuss politics or mathematics, the picture in short, not of a wonder from the East or an inspired idiot, or a psychological freak, but of a rational human being who happened to be a great mathematician". Some people may think that having been through a very trying life in the early days, and having achieved world fame almost overnight, Ramanujan might have become somewhat of an egoist. Prof. Hardy dispels this doubt completely by saying that "he (Ramanujan) was not particularly interested in his own history or psychology; he was a mathematician anxious to get on with the job".

In the remaining eleven chapters, Prof. Hardy takes some part of Ramanujan's work as his text, and sets down what occurs to him about its relation to that of earlier and later writers. He has brought out

admirably Ramanujan's originality, his extraordinary power of writing down imposing and generalised formulæ, and also his limitations. The second lecture deals with Ramanujan's work on the theory of primes. As Littlewood has said, every positive integer was one of Ramanujan's personal friends, but in this domain his work was limited by the fact that "he proved next to nothing, and a great deal even of what he imagined was false". Prof. Hardy quotes Littlewood as having said that "the clear-cut idea of what is meant by a proof, he (Ramanujan) perhaps did not possess at all; if a significant piece of reasoning occurred somewhere, and the total mixture of evidence and intuition gave him certainty, he looked no further". But Prof. Hardy admits that Ramanujan found the form of the Prime Number Theorem for himself and that this was a considerable achievement, inasmuch as only very great mathematicians like Legendre, Gauss and Dirichlet could discover it before him.

The third lecture deals with the joint work of Ramanujan and Hardy on the problem of determining the normal degree of compositeness of a number. The fourth lecture gives an analysis of Ramanujan's theorem about the number of numbers between A and X which are either squares or sums of two squares. The other lectures deal with Ramanujan's work on a lattice-point problem, partitions, hypergeometric series, asymptotic theory of partitions, representation of numbers as sums of squares, definite integrals and elliptic and modular functions. In each of these Prof. Hardy has described the genesis of Ramanujan's ideas, his rediscovery of the theorems of other great masters, and his almost uncanny generalisations which are still being tackled and proved by eminent mathematicians. On going through Prof. Hardy's pages we are impressed by one fact above all others,

and that is that Ramanujan's is perhaps the only example in the history of mathematics of one man alone providing the life-work of several of his eminent contemporaries.

There is one remark of Prof. Hardy with which it is difficult to agree. Prof. Hardy says: "I very much doubt whether Ramanujan, to the end of his life, ever understood at all clearly what an analytic function is." It should be remembered that Ramanujan stayed at Cambridge for more than three years, and passed the mathematical Tripos. He was dealing with infinite series every day, and as his work on the lattice-point problem shows he was conversant with the idea of a domain. There is nothing very complicated about the analytic function, and there is no reason why Ramanujan should not have grasped either the Cauchy Riemann or the Weierstrassian definition of an analytic function at the first reading. However, if Prof. Hardy's conjecture is true, it does not speak much for the teaching of mathematics at Cambridge, which could not make a Ramanujan understand the nature of an analytic function at the end of a three years' course. We hardly think that Prof. Hardy himself would like to be forced to this conclusion.

Prof. Hardy has given a historical and explanatory note along with each lecture, and there is a representative bibliography attached at the end of the book. The printing and get-up is all that is expected of a Cambridge University publication.

We are strongly of the opinion that a copy of this book must be in every mathematical library as well as in the hands of everyone who wishes to acquaint himself with the working of the mind of an inspired mathematician who, like Abel and Galois, was snatched away in his prime, and but for whose premature death many chapters in mathematics would have been enriched beyond measure.

M. R. SIDDIQI.

METROLOGY OF PUNCH-MARKED COINS

- (1) **A Note on Two Hoards of Punch-marked Coins Found at Taxila** (4 pages).
- (2) **On the Study and Metrology of Silver Punch-marked Coins.** By D. D. Kosambi. (*Reprints from New Indian Antiquary*, Vols. 3 and 4.).

IN these two papers Prof. Kosambi makes an excursion into the most intriguing section of ancient Indian numismatics with very happy results. He brings the organon of Statistics to bear on the problems relating to punch-marked coins, and the weights and symbols which seemed to defy all the diligent analysis and classification to which they were subjected by two generations of numismatists bid fair to fall into a more or less intelligible system. The mathematics of it all is beyond the comprehension of the reviewer who is well content to take it on trust from so eminent a mathematician. The conclusions reached by this new method are, some of them at first sight, surprising; they may not receive ready acceptance, and it is possible that further analysis of data and reflection may lead Prof. Kosambi himself to modify them; for as he himself remarks somewhere, 'there is every danger here of guessing too much'. But the easy mastery of the literature on the subject evinced by Prof. Kosambi, and the elegance with which he threads his way through the confusing mass of detail are such as to rouse the reader's admiration and make him wish with all his heart that Prof. Kosambi would make numismatics his second love though tensor analysis may continue to be his first.

While appreciating and making good use of the work of his predecessors in the field, Prof. Kosambi is an unsparing critic of the wrong methods employed by them and their inaccurate reporting of facts. He exposes the hollowness of much pseudo-expertise that has held the field till now, and if he occasionally employs hard phrases, they must be taken to be an index of Prof. Kosambi's reaction to slipshod thinking and lazy arm-chair methods. He draws attention to many inaccuracies in detail in Walsh's *Memoir* on the Taxila hoards—paper (1) above being devoted exclusively to this necessary negative criticism of one of the 'main sources' of the constructive

work attempted in the longer paper (2). His estimate of Mr. A. S. Hemmy's statistical work on weights and currency standards is perhaps best conveyed by the sentence: 'If imposing technical terms are to be used to impress archæologists and orientalists, at least the most useful ones should be taken, and an attempt made to use them properly' (p. 15). He rightly grumbles (p. 56) against the lack of co-ordination in the work of the Archæological department seen in the totally different arrangement and notation followed in the two monographs on Punch-marked coins (nos. 59 and 62) issued under the auspices of the department within a few months of each other. He puts in a plea for more accurate and integral recording of the data from each hoard of coins as it is discovered.

In metrology the chief contribution of Prof. Kosambi lies in the opinion he puts forward (p. 13) 'that the *rati* was not used, even in ancient times, to weigh the coins, but rather the coins determined the choice of the seed, exactly as at present'. This, if correct, disposes of many vexed discussions on the *rati*. But it leaves the absolute standard of weight indeterminate, and the tradition of a standard *purana* of 32 *ratis* is a really old one in our country, witness *Manu* VIII. 136; so that it seems quite natural for numismatists to worry over finding a reconciliation between actual weights of the old coins they handle and the theoretical standard weight. The system of Mohenjo-Daro weights was applied for the earlier Taxila hoard, but in the Mauryan period only in a crude manner (pp. 44-45).

In the interpretation of the punch marks Prof. Kosambi briefly reviews older opinions and methods and makes several suggestions of great practical value. He is not inclined to attach much importance to the persistence of some Mohenjo-Daro symbols among the punch marks on the coins or to ascribe any unduly high antiquity to any of the known coins. He allows for the influence of religious and tantric notions, but on the whole proceeds on the assumption that coinage is a function of the State. He keeps the distinction between obverse and reverse marks clear, and suggests that the reverse marks represent some sort of periodic checking—a suggestion supported by the

remarkably steady drop in average weight particularly for the square coins with the increase in the number of reverse marks (p. 30 and fig. 3). However, "from the fact that an occasional coin with blank reverse occurs in the oldest groups, it is clear that the system of reverse marks applied only to coins in active circulation, and perhaps in a limited region" (p. 31).

The obverse marks have been discussed far more by earlier writers and Prof. Kosambi reviews the numerous suggestions offered and points out several 'neglected possibilities' (p. 11) before stating his own working hypothesis as to the meaning of the symbols. He accepts the crescent-on-arches as the monogram of Chandragupta Maurya, and considers its absence from the earlier hoard a guarantee of its pre-Mauryan character. He isolates a particular variety of the *Sadaracakra* (six-armed symbol) occurring with Chandragupta monogram as the dynastic symbol of Mauryas and suggests that the form of the *Cakra* should be made the basis of classification by dynasties. The peacock on arches is also Mauryan, and the arches themselves are taken to indicate 'descent from'—at least the five arches. Equally plausible identifications are made of the symbols for Sisunaga, Saisunaga, and Nandin,

and those of Mahapadma are reached by elimination.

Prof. Kosambi says more than once that with the establishment of the Mauryan empire we enter on a period of cruder coinage in which 'the variances jump up suddenly', and *prima facie* the condition of the second and later Taxila hoard seems to support this. Yet, this conclusion hardly tallies with impressions of the Mauryan epoch gathered from other sources like the inscriptions of Asoka, or the polished stone pillars—not to speak of Megasthenes and the *Arthashastra*. There are other statements, *obiter dicta*, which may surprise the reader, and even shock him; but there is much, very much in these papers and in their method for which he will be grateful. The work that Prof. Kosambi has been doing is important, and one hopes that the Director-General of Archaeology, the museums of the country and individual owners of coin-cabinets will give him all the aid he needs for carrying his researches further. It is a pleasure to see the evidence of his collaboration with Dr. S. Paramasivan of the Madras Museum whom he cites for the phenomenon of decupification (p. 43) that has not so far been taken note of by numismatists.

K. A. N.

AN AID TO STUDY OF KANT

An Introduction to Kant's Critique of Pure Reason. By N. A. Nikam, M.A. (The Bangalore Printing and Publishing Co., Ltd.), 1941. Pp. 195. Price Rs. 5-8.

Much of the possible criticism having been disarmed or rendered innocuous by the utterances or the *obiter dicta* of the author like "I shall not be dissatisfied if this *Introduction to the Critique of Pure Reason* be described as a partially mistaken help" (Preface), and "If this book cannot claim originality in Kantian scholarship, it can at least claim originality in reversing Kant's order of treatment" (p. 63), I would consider the task of reviewer considerably lightened, though this comment would not certainly mean any disparagement of the excellent work of Prof. Nikam who has made a serious and sustained attempt to push Kant's "Critique of Pure Reason" into the focus of academic awareness and critical consciousness. Helped by a Mysore Government

scholarship, he had the "matchless piece of philosophical good fortunes" (viii—I emphatically protest against the typographical plural!!) "in attending the lectures of G. E. Moore and C. D. Broad which kindled and stimulated" his interest in Kant. In ten chapters, Prof. Nikam has admirably analysed the contents of the "Critique". Prof. Nikam has easy and perfect control over the subject-matter and I would invite attention of readers particularly to pp. 145-152 in which he sums up the "Central Teaching of Kant's Philosophy", with convincing clarity and intimate insight.

Time was when Indian philosophers were contributing namby-pamby discussions to foreign periodicals on "Kant and Bhagavad-Gita", "Kant and Sankara" and so forth, and I am glad to note that Prof. Nikam has not indulged in blowing the soap-bubbles of pretty, but puerile parallelisms between Kant and Indian idealists like Sankara. But

in a foot-note, he has referred to Advaita in the spelling of which he was caught within the grips of the Printers' Devil. And again "Aham-padartha" is outrageously printed though Advaita has been corrected in "Errata".

Kant's "Critique" has been "made in Germany" with especial emphasis. I wish Prof. Nikam had not echoed or re-echoed the familiar critical judgments on Kant. It will not be an exaggeration to state that a real and genuine estimate of Kant has yet to be attempted by Western philosophers themselves. Whether at all Kant ever woke up from the dogmatic slumber from which he claims to have been rudely awakened by Hume, and whether at all he has effected any Copernican revolution in philosophical outlook are some of the persistent problems of Kantian *Weltanschauung*, and though as Prof. Nikam points out (p. 21) Kant himself might not have urged or adumbrated such a claim, critics have a duty to examine the claim that the most striking contribution of Kant is transference of philosophical emphasis from the objective to the subjective. Prof. Nikam does not examine the claim in any detail.

The fact is that on the plea of an analysis of the conditions and characteristics of *a priori synthetic judgments*, Kant has really constructed an elaborate and imposing totalitarian structure in philosophy. Surprise, bewilderment, astonishment and admiration which have marked reaction to Kant's work are all due to the psychological dread of the unknown and the ununderstood. There are many who are likewise scared away by the style of Sankara. In the Kantian scheme of *Totalitarian Metaphysics* the

objective reality was assigned some sort of existential recognition in a patronising manner and it is this totalitarian scheme that supplied the motive-force of the subsequent totalitarian metaphysics of Nietzsche who advocated the cult of the *Urbemensch*, master-morality, slave-morality and the like. In Hitler's campaigns against Democracy and against all weaker nations, one witnesses directly the practice of the totalitarian philosophy of Kant and Nietzsche. Psycho-analysis of the Freudian brand was perfected in Germany, and there is no use fighting shy of the same psycho-analytic technique being applied to an analysis of the metaphysical mind of Kant as revealed in his "Critique".

Be that as it may, Prof. Nikam seems to view the work of Prof. Paton almost with religious awe and fervour as if biblical sacrosanctity attached to it! Prof. Paton has to be rated as an enthusiastic admirer of Kant, and like all admirers he naturally seeks to make much of Kant and his work. Paton's estimate of Kant is not after all altogether a philosophically detached one.

It is noteworthy that a citation from Omar Khayyam stands at the opening of each chapter. Prof. Nikam should therefore not blame the reviewer if he closed with the observation that after a fairly careful study of the work of Prof. Nikam, the reviewer was obliged to come out of the edifice or structure of the Kantian metaphysics by the same door as in he went!! Still, I heartily commend Prof. Nikam's neat little volume on Kant as an eminently suitable text-book for university students of the philosopher of Konigsberg.

R. NAGA RAJA SARMA.

CENTENARIES

Baskerville, Simon (1574-1641)

SIR SIMON BASKERVILLE, a British physician, was born at Exeter October 27, 1574. He joined the Exeter College, Oxford, in 1591 and was elected a fellow even before he graduated. He became M.B. in 1611 and after some practice entered the College of Physicians, London, in 1614 and became a fellow thereof in 1615.

Even when Baskerville was an undergraduate his brilliance was such that when James I visited the University, he was "chosen as a prime person to dispute before him in the philosophic art, which he performed with great applause of his majesty". In later years when

he rose to eminence as a doctor, he was appointed physician to James I and later to Charles I who knighted him in 1636.

Baskerville had such wide practice and thereby amassed so much wealth that he came to be known as "Sir Simon Baskerville the rich". He was also generous. 'He never took a fee of an orthodox minister under a dean nor of any suffering cavalier in the cause of Charles I but with physick to their bodies generally gave relief to their necessities'.

Baskerville died July 5, 1641.

S. R. RANGANATHAN.

University Library,
Triplicane.

SCIENCE NOTES AND NEWS

Leguminous Plants and Their Root-Nodule Bacteria.—The view that a leguminous plant will symbiose with only one or closely related strains out of the many strains of the nodule-forming organisms that may exist in the soil and that the division of these organisms into several distinct (some twenty in number at present) plant-bacteria groups based upon that view, have formed the subject of a very elaborate examination and conclusions very much at variance with this view have been arrived at as the result (J. K. Wilson, *Memoir* 221, Cornell University Agr. Exp. Stn.). About 200 species of plants representing more than 70 genera, and 32 strains of the rhizobia isolated from a wide range of plants were used in the work, and each species was exposed during its growing period to each strain. After a suitable period of growth the roots were examined for nodules, the presence of which was taken as the criterion of symbiosis. It was found that a number of plants were promiscuous and will symbiose, as measured by the nodulation, with almost any strain of nodule bacteria with which their roots may come into contact. Conversely, certain strains of bacteria isolated from various different plants will symbiose with species of plants that represent a large majority of the plant-bacteria groups. Plants were also grown with their root systems divided and allowed to grow with each division in a separate soil medium with a different strain of bacteria; they symbiosed in all these different media and showed that a plant could simultaneously symbiose with several strains. It however appears from the plates which illustrate the paper that nodule formation is not equally plentiful or striking in all the different strains with which a plant can symbiose. While many plants can symbiose with several strains of rhizobia there were others which were somewhat restricted as to the number of strains they could symbiose with. Another conclusion reached is that these plants that are promiscuous will symbiose with strains that are predominantly monotrichic and predominantly multitrichic, while those which are restricted symbiosed with strains that are predominantly monotrichic. A. K. Y.

Cardamom Weevil and Its Control.—Further work on the cardamom weevil (*Prodiots haemeticus*) has been carried out by Mr. S. Jones, M.Sc., Assistant Entomologist, Central Research Institute, Trivandrum.

There are evidences of the weevil proving to be a major pest of potential danger to cardamom cultivation in S. India, specially in Travancore.

The weevil, a brown, spotted insect, lays its eggs on the rhizomes, the grubs that hatch out boring into them and later into the shoots. The external symptoms become evident only after the attack has well advanced.

A promising method of eradication of the

pest, has suggested itself and it consists of rooting out and burning the diseased clumps and picking of the adult weevils, when they appear in fairly large numbers and rest on the cardamom plants, from the second week of April, presumably for mating.

The Lady Linlithgow Tuberculosis Sanatorium, Kasauli.—Her Excellency the Marchioness of Linlithgow, the President of the Tuberculosis Association of India, performed the Opening Ceremony of this all-India institution on the 21st of May 1941, in the presence of a distinguished gathering. This sanatorium will have accommodation for 112 beds to begin with, which, it is hoped, in course of time will be increased to 250 beds.

In the course of her speech Her Excellency said: "It is necessary to emphasise that the greatest difficulty in the tuberculosis campaign in India is not, as generally supposed, lack of money, but the lack of a sufficient number of doctors properly trained in modern methods of diagnosis and treatment. It is a hopeless task to try and fight tuberculosis in India without having doctors who have specialised not only in diagnosis and treatment but also in the prevention of the disease and in the care and after-care of the tubercular patient. The difficulty facing us is not the lack of doctors willing to take up special training, but that there are in India too few places where all the facilities exist for the proper training of such doctors. This training requires at least nine months' residence in a fully equipped modern sanatorium, such as this one, where doctors can gain experience in the wards, in the operating theatre, the X-ray and the laboratory. Research work will also be carried out there, without which no teaching institution can be complete. By research I don't mean only bacteriological research, but research necessary with regard to the development of the disease and the various treatments.

While bacteriological research can be carried out in a comparatively small institution, the other kind of research can only be effectively carried out in a sanatorium or hospital with a large number of patients."

Basic Steel from Scrap.—Steel made by the acid process from 100 per cent. scrap is now being manufactured in India. It is anticipated that this will relieve the shortage of spring steel required by the Railways which had hitherto been imported.

Arrangements are also being made for the erection of open hearth furnaces for making basic steel from scrap collected from all over India.

Further, experiments are in hand for utilizing the large quantities of turnings and borings produced in shell manufacture. Previously these had always been looked upon as a waste

product, but they will now be turned into new steel.

Industrial Research Council.—Details are now available of the action taken by the Government of India on certain recommendations of the fifth session of the Industrial Research Council.

As the need of a clearing house of information regarding industrial research was generally felt, the Council had recommended that the Industrial Research Bureau might undertake this work and also circulate periodically information as to researches and investigations in progress in India in order to enable researchers on the same or allied subjects to exchange information. This is being arranged for under the auspices of the Board of Scientific and Industrial Research.

The recommendation of the Council that the Director of Industrial Research Bureau be requested to prepare and circulate, after consultation with Directors of Industries and others concerned, a draft questionnaire to assist in any survey of the tanning industry and to draw up and circulate an outline of a scheme on which the survey of the tanning industry should be conducted, will be referred to the Director of Scientific and Industrial Research for consideration and proposals.

The Council had also recommended further enquiries regarding utilisation of milk casein for the manufacture of plastics, investigation of the production of acetic acid, acetone and related compounds for the viscose process of artificial silk manufacture, the manufacture of synthetic resin of the bakelite type, the possibility of manufacturing formaldehyde and urea, investigation of the available sulphur-bearing deposits in India, utilisation of linseed straw for the production of cottonous flax, and the more efficient utilisation of coal. These recommendations will be borne in mind by the Research Committee of the Board of Scientific and Industrial Research. Large deposits of sulphur have already been discovered by the Geological Survey of India in Baluchistan and elsewhere.

Archaeological Survey Reports.—An index covering the series of annual reports of the Archaeological Survey of India from 1919 to 1929 and the first part of the reports from 1902 to 1918 has been issued. The work has been done by Mr. H. Hargreaves, formerly Director-General of Archaeology, and enables the entire material published in the reports of the Archaeological Department to be referred to with facility. An index of Part II of the reports for the years 1902 to 1916, prepared by the late Mr. G. R. Kaye, was issued some years ago.

Andhra University — Two Events.—The Andhra University has recently inaugurated the Natural Science Department under distinguished auspices. Without this complement the organization would be lopsided and even artificial. We hope that under the stimulating influence of the distinguished Vice-Chancellor this new academic recruit will acquire sufficient

energy in the field of teaching and research, which will place it on a level with the older branches of science. From the standpoint of exploration and investigation the Andhra Desa is sufficiently rich and varied in its biological resources which offer practically an unlimited scale of activities to the research workers. With a well regulated scheme of co-ordination among the different branches of the Department the Andhra University will be able soon to establish schools of biological teaching and research. It would be premature to discuss the organisation of departments of applied biology—but its consideration need not be unduly delayed because of the decided advantages offered by the flourishing departments of chemical technology and organic chemistry.

Another equally interesting and important institution known as Faculty Club was formally inaugurated. One of the inescapable consequences of our being men is that we have a stomach on whose shape and condition depends the peace of the world as well as the progress of knowledge. Worked in conjunction with the class room efforts and the laboratory practice we anticipate that the Club will exercise a soothing and generous influence in promoting the cheerful and healthy temperament of the University. The institution of a Faculty Club is calculated to dispel dyspepsia, melancholia, neurasthenia and other mental ailments peculiar to the teaching profession and the coming into being of common messmates in the University Halls will inspire a new spirit of comradeship and co-operative effort among the members of the staff. Now all that the scholars have to do is to read their books and keep their bowels open to receive the blessings of this new dispensation.

ASTRONOMICAL NOTES

Planets during August 1941.—Venus will be an evening star and continues to separate slowly from the Sun; although not quite favourably placed for observation, it will be a fairly bright object in the western sky, setting about two hours after the sun. Mercury is in the morning sky for the first half of the month, but being too near the sun will not be easily visible; it passes superior conjunction on August 19. Mars rises about three hours after sunset and can be seen during the remaining portion of the night as a brilliant red star of magnitude -1.3 ; it is moving rapidly eastward along the southern border of the constellation Pisces. The planet is getting nearer the earth, the apparent diameter increasing from $15''.0$ to $19''.4$ during the month.

Saturn rises at about midnight and Jupiter an hour later; and both can be conveniently observed near the meridian a little before sunrise. Jupiter is increasing in brightness, its stellar magnitude at the end of the month being -1.8 (a fifth of a magnitude brighter than Sirius). Saturn also is getting brighter and the ring system continues to widen. The planet will be in quadrature with the Sun on August 21. Uranus is in Taurus and three to four degrees to the northeast of Saturn.

Neptune is in the evening sky and is situated very near (about half a degree north) the star β Virginis—magnitude 3.8. A close conjunction of the planet with Venus will take place on the evening of August 18, which will be helpful to observers with small telescopes, in locating Neptune.

The Perseids.—One of the most interesting of the meteoric showers is that known as the Perseids whose maximum display may be expected to occur about August 12. The radiant point is in the constellation Perseus and the position is given by R.A. $3^h 8^m$ and Declination 57° N. (four degrees to the north of the bright star γ Persei). The duration of the shower is about 25 days and the average number of meteors that can be seen per hour is 50.

T. P. B.

MAGNETIC NOTES

The month of May, 1941, was magnetically more active than the preceding month. There were 5 quiet days, 22 days of slight disturbance and 4 of moderate disturbance as against 9 quiet, 20 slightly disturbed and 2 moderately disturbed days during May 1940. The characters of individual days are given in the following table:—

Quiet days	Disturbed days	
	Slight	Moderate
2, 19, 26, 28 & 29	1, 3-5, 7-16, 18, 20, 22, 23, 25, 27, 30 & 31	6, 17, 21 & 24

The most quiet day in May 1941, was the 19th and the most disturbed, the 21st. One

moderate storm was recorded during the month as in May, 1940. The mean character figure for the month was 0.97 as against 0.77 for May 1940.

The month of June 1941, was more active magnetically than any of the preceding months in the year. There were 22 slightly disturbed and 8 moderately disturbed days as against 9 quiet days, 19 days of slight disturbance and one day each of moderate and great disturbance in June 1940. The most disturbed day in the month was the 13th when a magnetic storm of moderate intensity was recorded. The least disturbed day in the month was the 16th. There were no quiet days in the month. The characters for individual days are given below:

Quiet	Disturbed days	
	Slight	Moderate
..	1-8, 11, 12, 16-26 & 28.	9, 10, 13-15, 27, 29 & 30.

Three magnetic storms of moderate intensity were recorded during the month as against one of great intensity in June 1940. The mean character figure for June 1941 was 1.27 as against 0.77 for June 1940.

SEISMOLOGICAL NOTES

During the month of June 1941, one very great, three moderate and three slight earthquake shocks were recorded by the Colaba seismographs as against one moderate and one slight shock recorded during the same month in 1940. Details for June 1941, are given in the following table:—

Date	Intensity of the shock	Time of origin I. S. T.		Epicentral distance from Bombay	Co-ordinates of the epicentre (tentative)	Depth of focus	Remarks
June 1941—		H.	M.	(Miles)		(Miles)	
24	Moderate	14	58	3430	$38^\circ 7' \text{ N.}, 18^\circ 8' \text{ E.}$, in the Ionian Sea		
26	Very Great	17	22	1470	In the neighbourhood of the Nicobar Islands		
27	Slight	13	03	1450			} After shocks of the very great shock of 26th.
27	Moderate	14	02	1490			
28	Slight	00	34	1520			
28	Slight	23	25	1520			
30	Moderate	23	54	1420	$13^\circ 5' \text{ N.}, 93^\circ 7' \text{ E.}$, In the neighbourhood of the North Andaman		

ANNOUNCEMENTS

Indian Science Congress Association (Twenty-ninth Session).—The General Secretaries of the Indian Science Congress Association, Professor S. K. Mitra and Principal P. Parija, have released the following information in connection with the Twenty-ninth Session of the Indian Science Congress to be held from the 2nd to the 8th January 1942:

The Session was originally proposed to be held at Dacca, but the University of Dacca, under whose auspices the Session was to have been held, having recently decided otherwise, the Congress Session will be held at Baroda in response to the kind invitation of His Highness the Maharaja Saheb. Principal K. G. Naik of Baroda College has been requested by the Baroda Government to start with the necessary arrangements.

Mr. D. N. Wadia, M.A., B.Sc., F.G.S., F.R.S.B., F.R.A.S.B., F.N.I., Mineralogist, Ceylon Government, Colombo, will be the President.

Application forms for Ordinary and Sessional Membership for the Congress may be obtained from the Office of the Association, 92, Upper Circular Road, Calcutta.

Papers proposed to be read should be forwarded to the General Secretary together with three copies of abstracts so as to reach him not later than September 15, 1941.

The enrolment of the *Ordinary Members* will be closed after the 15th of July 1941. Only Sessional Members will be enrolled after that date.

Intending members are requested to send their subscriptions to the Treasurer, Indian Science Congress Association, 92, Upper Circular Road, Calcutta.

Flora of the Punjab Plains.—Since the publication of the note in *Current Science* (May 1941), Dr. Sabnis, the author of the pamphlet has informed us, that he proposes to issue further contributions on the Flora of the Punjab Plains and the Associated Hill regions to include the remaining natural orders. The publication that has appeared is to be regarded as the first in the series.

We acknowledge with thanks the receipt of the following:—

"Journal of the Royal Society of Arts," Vol. 89, Nos. 4580, 4583 and 4585.

"Journal of Agricultural Research," Vol. 61, No. 12 and Vol. 62, Nos. 1-3.

"Indian Journal of Agricultural Science," Vol. 11, Pt. II.

"The Nagpur Agricultural College Magazine," Vol. 15, No. 4.

"Journal of Chemical Physics," Vol. 9, No. 5.

"Chemical Products and Chemical News," Vol. 4, Nos. 5-6.

"Experiment Station Record," Vol. 84, Nos. 4 and 5.

"Allahabad Farmer," Vol. 15, No. 3.

"Transactions of the Faraday Society," Vol. 37, Pt. 3.

"Indian Farming," Vol. 2, No. 6.

"Genetics," Vol. 26, No. 3.

"Review of Applied Mycology," Vol. 20, Parts 3-4.

"The Mathematics Student," Vol. 8, No. 4, and Vol. 9, No. 1.

"The Bulletin of the American Meteorological Society," Vol. 22, Nos. 3-4.

"Journal of the Indian Mathematical Society," Vol. 5, No. 1.

"The Indian Medical Gazette," Vol. 76, No. 6.

"Journal of Nutrition," Vol. 20, Nos. 3 and 5.

"Journal of the American Museum of Natural History," Vol. 47, No. 4.

"Nature," Vol. 147, Nos. 3719, 3725, 3728, 3729 and 3730.

"Journal of Research" (National Bureau of Standards), Vol. 26, No. 4.

"Canadian Journal of Research," Vol. 18, No. 12 and Vol. 19, No. 3.

"Sky," Vol. 5, No. 7.

"Science and Culture," Vol. 7, No. 1.

"The Indian Trade Journal," Vol. 141, Nos. 1825-28.

BOOKS

"Recent Advances in Sex and Reproductive Physiology," by J. M. Robson. (Messrs. J. A. Churchill, Ltd.), 1940. Pp. xii + 329. Price 15sh. net.

"The Birth and Death of the Sun," by George Gamov. (Macmillan & Co.), 1941. Pp. xiv + 232. Price 12sh. 6d. net.

"The Bombay Karnataka"—A Geographical Survey, by B. S. Sheshgiri. 1941. Pp. i + 208. Price Rs. 2.

"The Air and Its Mysteries," by C. M. Botley. (The Scientific Book Club, London), 1940. Pp. 1 + 266. Price 2sh. 6d.

"The Annual Review of Physiology," edited by James Murray Luck. (The American Physiological Society and Annual Reviews Inc.), 1941. Pp. viii + 784. Price \$5.00.

"The Social Life of Animals," by W. C. Allee. (The Scientific Book Club, London), 1941. Pp. xiv + 261. Price 2sh. 6d.

"General Bacteriology," by D. B. Swingle. (Chapman & Hall, London), 1941. Pp. xii + 313. Price 16sh.

"Aircraft Engines," Vol. II, by A. W. Judge. (Chapman & Hall, London), 1941. Pp. viii + 446. Price 30sh.

"Electrodynamics," by Leigh Page and Norman Hilsley Adams (Jr.). (Chapman & Hall, London), 1941. Pp. xii + 506.

ACADEMIES AND SOCIETIES

Indian Academy of Sciences:

June 1941. SECTION A.—R. V. SUBRAHMANYAN: The spectral character of the reflection by a regularly stratified medium: Part I. For a given number of plates, the bands are more sharply defined for smaller values of the reflecting power, though the intensity of the reflected light is smaller. Some secondary bands begin to appear on the shorter wavelength side, when the reflecting power is sufficiently large. P. G. N. NAYAR: Luminescence, absorption and scattering of light in diamonds: Part I. Fluorescence. The spectrum is found to consist of a sharp band at 4156 Å, followed by a set of discrete but rather diffuse bands at 4278, 4387, 4514 and 4643 Å. The effect of temperature on the bands has been studied from -180° to 200° C. The fluorescence disappears at higher temperatures, the band at 4156 falling off in intensity at a more rapid rate than the other bands. K. R. DIXIT: Effect of admixture of silver on the rectifying properties of Cu-Cu₂O cells. The rectification is maximum for 7½% Ag when temperature of formation of layer is 800° C. R. R. BAJPAI and V. I. VAIDHIANATHAN: On the preparation of quartz ultrasonic oscillators. L. RAMACHANDRA ROW and T. R. SESHADRI: Pyrilium salts derived from 4-O-methyl resorcylic aldehyde. HANSRAJ GUPTA: Some idiosyncratic numbers of Ramanujan. N. A. SHASTRI: Some relations between Bessel functions of third order and confluent hypergeometric functions. S. S. PILLAI: On the sum of functions connected with primitive roots. S. S. PILLAI: On M consecutive integers—III. P. G. N. NAYAR: Luminescence, absorption and scattering of light in diamonds: Part II. Phosphorescence. True fluorescence lasting for less than 10^{-4} seconds consists of the region of discrete bands alone. The phosphorescence takes a time of the order of a minute, for its full excitation, and several minutes for its decay. S. BHAGAVANTAM: Raman effect in relation to crystal structure:

Lattice oscillations. P. BHASKARA RAMA MURTI: Paper pulp from annual crops. Part II. A note on the yields and characteristics of pulps from different varieties of rice straw. S. RAJAGOPALAN: Synthetical experiments in the group of sympathomimetics. Part II. Poly- and hetero-cyclic ring systems.

SECTION B.—M. DAMODARAN and T. R. VENKATESAN: Amide synthesis in plants. I. The succinoxidase system in plants. KANHAIYALAL MATHUR and REAYAT KHAN: The development of the embryo sac in *Vogelia indica*, Lamk. B. L. KAW: Studies on the Helminth parasites of Kashmir. Part I. Description of some new species of the genus, *Pomphorhynchus Monticelli* (1905). MISS C. K. RATHNAVATHY: The spermatogenesis of *Clibanarius olivaceus*, Henderson.

Royal Asiatic Society of Bengal:

July 7, 1941.—Tibetan and Bhotia blood group distributions: At an ordinary monthly meeting of the Royal Asiatic Society of Bengal. Dr. Eileen W. E. Macfarlane presented a paper on the Tibetan Bhotia blood group distribution.

One hundred and twelve mixed Bhutias were grouped at Darjeeling, North Bengal. They showed less of Group B than of Group A and over 10 per cent. of Group AB. When those born in Tibet were separated from those born in Sikkim or Bengal the former were found to be genetically in equilibrium and the latter to be racially mixed. The Bhotias of Sikkim are known to have interbred with the Lepchas. They show three times as much of Group AB as the Tibetans, and this increase is at the expense of Group A. The blood group distribution in mixed Bhotias is of the same order as that found in the Khasis of Assam. A small sample of bloods was typed and indicates that Type N is scarce among the Bhotias and that the types are distributed as among the Bengalis.

